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SIMPSON SPRINGS STATION
HISTORICAL ARCHAEOLOGY IN WESTERN UTAH

by
Dale L. Berge

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SIMPSON SPRINGS STATION
HISTORICAL ARCHAEOLOGY IN WESTERN UTAH
1974 - 1975

by
Dale L. Berge

Utah State Office
Bureau of Land Management
1980

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FORWARD

The Bureau of Land Management Utah State Office proudly introduces Cultural Resource Monograph 6, "Simpson Springs Station - Historical Archaeology in Western Utah." This volume reports the extensive labor and research conducted by Brigham Young University and Dale L. Berge in understanding and interpreting architectural features at Simpson Springs, Tooele County, Utah. The efforts of BYU provided data necessary for the Bureau of Land Management to reconstruct the Simpson Springs Pony Express Station.

Gary J Wicks

Gary Wicks
State Director

EDITOR'S NOTE

Occupation of Simpson Springs covered nearly 75 years. The Bureau of Land Management, as part of the Bicentennial effort, desired to reconstruct the history at the Springs with emphasis upon the era of the Pony Express. Volume 6 presents the results of excavations conducted by Brigham Young University in 1974 and 1975. Field investigations were necessary to locate all site components (i.e. features and structures) and to determine their function and chronologies in preparation for overall site interpretation and reconstruction of the Simpson Springs Pony Express Station. Artifacts associated with a post-Pony Express era structure were described and prompted the author's inclusion of more detailed information. Although some sections appear to be disjointed or irrelevant to the main topic, they were included because they represent artifacts having the potential of being found in Utah. In this way, the consolidated information within this volume may be used as a laboratory or field artifact identification manual.

In 1975 the Bureau of Land Management Salt Lake District with the Future Farmers of America did reconstruct the early station. Interpretive exhibits and other facilities enhance the site today.

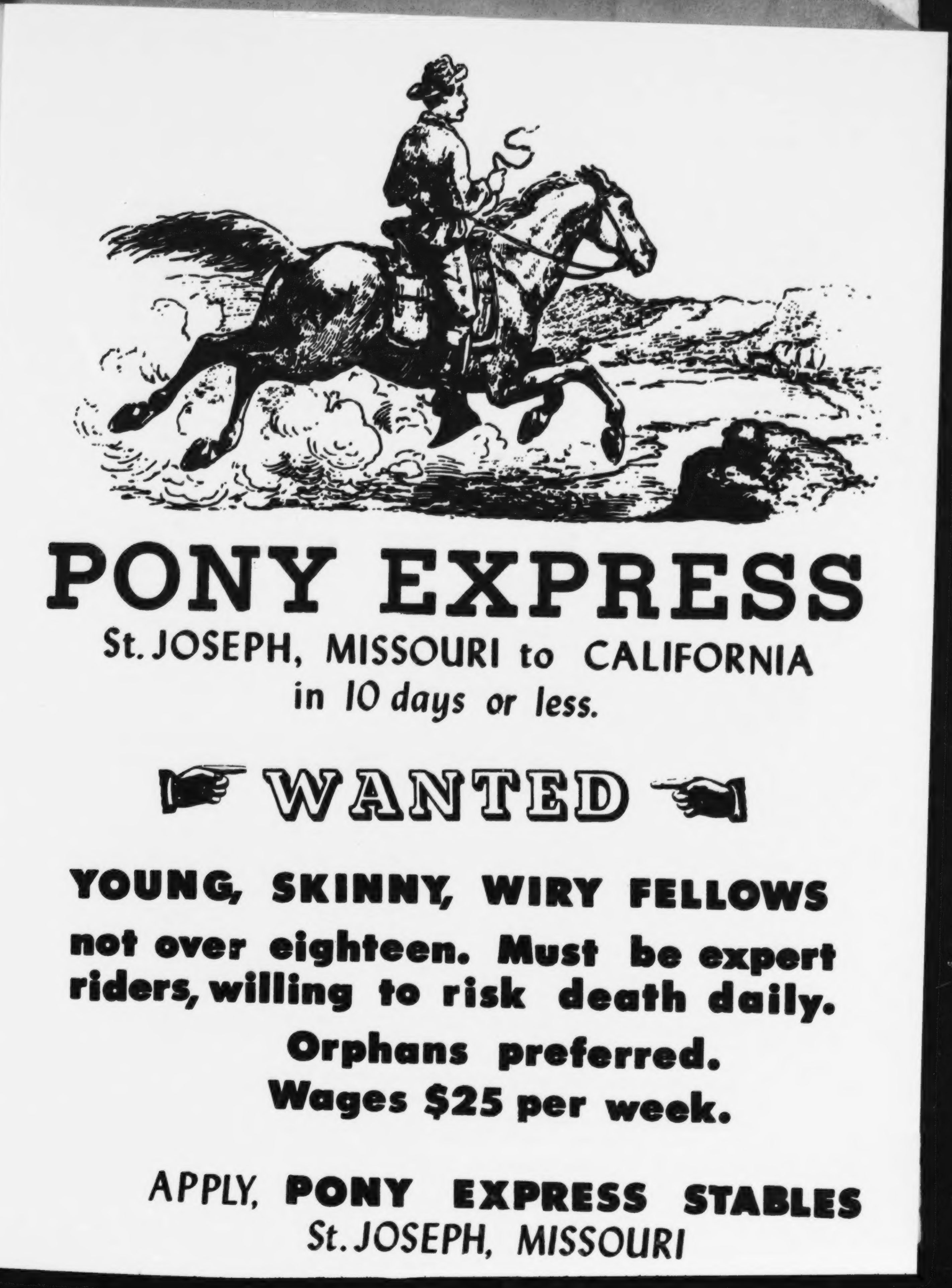
Richard E. Fike
BLM Archaeologist

SIMPSON SPRINGS STATION
HISTORICAL ARCHAEOLOGY IN WESTERN UTAH

by
Dale L. Berge

BRIGHAM YOUNG UNIVERSITY
MUSEUM OF PEOPLES AND CULTURES
Provo, Utah

1980



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PREFACE

The Bureau of Land Management has for several years been interested in developing the Pony Express Trail in western Utah. The present project at Simpson Springs took place during the summers of 1974 and 1975 as part of the federal government's interest in bicentennial activities. The purpose of the project was to establish which structure or structures actually dated to the times of the Pony Express in 1860-61. Early maps of the trail do not reveal the precise location of the station in relation to topographic features. Extensive use of the area has left remnants of the least three distinct periods: (1) 1860s; (2) 1890s ; and (3) 1920s. It was hoped also that the exposure of foundations would aid the restoration of the buildings, at least the early ones.

The arid environment in the area of Simpson Springs is typical of the basin-and-range topography of the Great Basin. The Simpson Mountains are covered with a Juniper-Pinyon forest, while the vegetation around the station and west consists of sagebrush and grasses. The highest peak of the Simpson Mountains is 7,035 feet above sea level, while at the base of these mountains the elevation is near 5,000 feet, gradually sloping off to the floor of the Great Salt Lake Desert. At the station the elevation is 4,920 feet above sea level. The elevation drops to the northwest at approximately 360 feet per mile. The even contours on topographic maps reflect the gradual decreasing levels of ancient Lake Bonneville, which existed during the late Pleistocene and had its apex around 50,000 years ago. The lower elevation became part of the Great Salt Lake Desert, which ultimately extends to the Bonneville Salt Flats and the Great Salt Lake.

The general area around Simpson Springs has been utilized well over a hundred years since its discovery. Horace Greeley (1860), who traveled along this route in 1859, made the following observations regarding the station:

> *In the afternoon, we came on, over a higher, rockier mountain-pass and a far rougher road, to the next station--Simpson's Spring, nearly fifty miles from Camp Floyd--where we halted for the night. I fear the hot suns of August will dry up this spring; while there is no other fit to drink for a weary distance south and west of this point.*
>
> *The station-keeper here gave me an incident which illustrates the character of the country. Some few days previously to our arrival, he ascertained that his oxen, eight in number, had gone off, two or three nights before, taking a southerly course; so he mounted a horse and followed their trail. He rode upon it one hundred miles without reaching water or overtaking the cattle, which had lain down but once since they started, and were still a day's journey ahead of him. If he continued the pursuit his horse must die of thirst, and then he too must perish; so he turned about and left his oxen to die in the desert or be found and eaten by savages. There was not a shadow of hope that he would ever see them again.*

The following year, 1860, Richard F. Burton (1862) traveled along the same route and described the area thus:

> *Passing out of Skull Valley, we crossed the cahues and pitch-holes of a broad bench which rose above the edge of the desert, and after seventeen miles beyond the Pass reached the station which Mormons call Egan's Springs, anti-Mormons Simpson Springs, and Gentiles Lost Springs.*
>
> *Standing upon the edge of the bench, I could see the Tophet in prospect for us till Carson Valley: a road narrowing in perspective to a point spanned its grisly length, awfully long, and the next mail station had shrunk to a little black knob. All was desert: the bottom could no longer be called basin or valley: it was a thin fine silt, thirsty dust in the dry season, and putty-like mud in the spring and autumnal rains. The hair of this unlovely skin was sage and greasewood: it was warted with sand-heaps; in places mottled with bald and horrid patches of salt soil, while in others minute crystals of salt glistening like diamond-dust in the sunlight, covered tracts of moist and oozy mud. Before us, but a little to the right or north, and nearly due west of Camp Floyd, rose Granite Mountain, a rough and jagged spine or hog's back, inhabited only by wolves and antelopes, hares and squirrels, grasshoppers, and occasionally an Indian family. Small sweet springs are found near its northern and southern points. The tradition of the country declares it to be rich in gold, which, however, no one dares to dig. Our road is about to round the southern extremity, wheeling successively S. and S.E., then W. and N.W., then S.W. and S.E., and S.W. and N.W.--in fact, round three quarters of the compass; and for three mortal days we shall sight its ugly frowning form. A direct passage leads between it and corresponding point of the southern hill: we contemplate, through the gap, a blue ridge where lies Willow-Spring Station, the destination of our party after tomorrow; but the straight line which saves so much distance is closed by bogs for the greater part of the year, and the size of the wild sage would impede our wagon-wheels.*
>
> *The great desert of Utah Territory extends in length about 300 miles along the western side of the Great Salt Lake. Its breadth varies: a little farther south it can not be crossed, the water even where not poisonous, being insufficient. The formation is of bottoms like that described above, benchlands, with the usual parallel and perfectly horizontal waterlines, leaving regular steps, as the sea settled down, by the gradual upheaval of the land. They mark its former elevation upon the sides of the many detached ridges trending mostly N. and S. Like the rim of the Basin these hills are not a single continuous mountain range which might be flanked, but a series of disconnected protrusions above the general level of the land. A paying railway through this country is as likely as a profitable canal through the Isthmus of Suez: the obstacles must be struck at right angles, with such assistance as the rough kanyons and the ravines of various levels afford.*
>
> *We are now in a country dangerous to stock. It is a kind of central point, where Pavant, Gosh Yuta (popularly called Gosh Ute), and Panak (Bannacks) meet. Watches, therefore, were told off for the night. Next morning, however, it was found that all had stood on guard with unloaded guns.*

This harsh environment as described by Greeley and Burton, over a century before this study, is the way it appears today, except for the Indians, now mostly gone or living on reservations. Simpson Springs with its trickle of water was most likely a welcome sight to tired and thirsty travelers.

It was the desire of the Bureau of Land Management (BLM) to excavate these existing structures, except the CCC camp, determine their approximate dates of usage, and determine, as far as possible, their individual functions. In order to interpret these data, it was necessary to recover the artifactual remains of the former inhabitants, determine their dates of manufacture, and correlate them to specific rooms or features.

The primary research aim was to establish a range of time for occupation of each structure through the use of written history, oral history, and archaeology. It was hoped that a level of credibility could be established among these three approaches. It was assumed that the archaeological evidence would provide the most accurate data for dating the structures, then history, and finally oral history, providing the least accurate details. This assumption could be falacious depending on the type of remains present at the site, the amount of historical documentation, or the individuals from whom oral history was derived. John Bluth, Charles Redd Center for Western Studies, Brigham Young University, possesses written reports provided to the Bureau of Land Management, on the documentary and oral histories of the area (Bluth 1975 and 1976). Fike and Headley (1979) have studied the pony express stations from historical research, mostly maps, also.

The archaeological investigations at Simpson Springs, believed to have been used by stage lines and Pony Express in the 1860s, were conducted for the Bureau of Land Management, Salt Lake District, during the summers of 1974 and 1975, under the direction of Dr. Dale L. Berge, Associate Professor of Anthropology, Brigham Young University. Assistant Director was Asa Nielson; members of the field crew consisted of Wes Carpenter, Ted Duggin, Jeff Bentley, and J. B. Earle, during the 1974 season; and Wes Carpenter, Ted Duffin, Dee Hardy, Jim Dykman, and Allan Carpenter in 1975. All were, at the time, students in the Department of Anthropology and Archaeology, Brigham Young University.

The artwork was done by Louise Hatch, Linda Decsesznak, and Brian Turner, Department of Art and Design, Brigham Young University.

I would like to express appreciation to the Bureau of Land Management for allowing me to accomplish the field excavation and to complete this report. Special thanks to Geoff Middaugh for his encouragement, and I am expecially indebted to Richard Fike for his friendship, enthusiasm and help with the identification of the bottles described herein.

Finally, I must thank the Museum of Archaeology and Ethnology, Brigham Young University, for providing facilities to accomplish this study, as well as perpetual storage space for notes and artifacts.

Dale L. Berge
1980

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CHAPTER 1

INTRODUCTION

The Simpson Springs Station is situated approximately 26 miles west of the city of Vernon, Tooele, Utah. It is located in the northeast quarter of Section 18, Township 9 South, Range 8 West, Salt Lake Meridian at the western base of the Simpson Mountains (Map 1). The present dirt road runs parallel to, near or on the old Pony Express and stagecoach trail. Modern recreational facilities have been constructed at Simpson Springs east of the road by the Bureau of Land Management, Salt Lake District (Figure 1). The stations along the route in western Utah (Map 2) have been marked with historic monuments built of stone (Figure 2). Remnants of structures reflecting over one hundred years of activity are still visible on the ground surface.

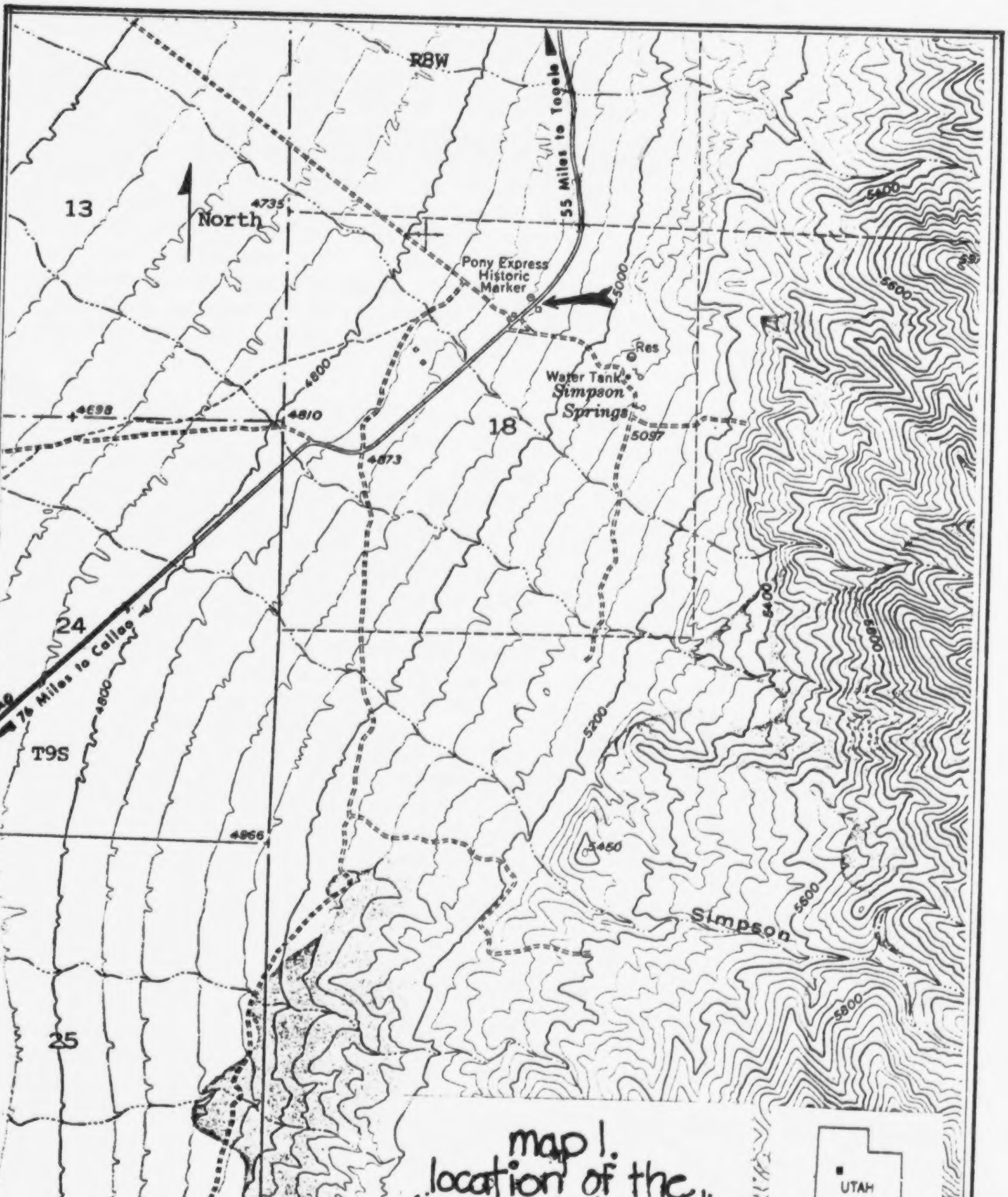
Prior to excavation, four architectural features were visible on the ground surface. They were labeled as Structures 1 through 4 (Map 3 and Figure 3). Structure 1, assumed to be the original station, is located on the west side of the existing road; it consisted of a stone foundation outlining three possible rooms. The room farthest north formed a depression about three feet deep, while the other two were relatively shallow. Structure 2, once thought to be a corral, was a circular outline of rocks, the east side comprised of an outcrop of volcanic tuff. Structure 3, thought to be a relatively recent store, still had standing walls and had been fenced in by the Bureau of Land Management to deter vandalism (Figure 4). The walls of this structure were gradually eroding away by water action on the soft mortar made from the local tuff and clay. Structure 4, considered to be a root cellar, was a large depression in the ground (Figure 4). However, artifacts on the ground surface indicated some type of underground feature existed. Further south of these four structures were concrete footings and walls of a Civilian Conservation Corps (CCC) camp (Figure 5).

Excavated Features and Associated Discoveries

During the 1974 field season, Structures 1 and 3 were excavated, along with a number of test trenches (Map 4). Digging began on Structure 1 because it was to be restored later that summer. Structures 2 and 4 were unearthed in the summer of 1975. These latter ruins were dug to define features in areas where construction was going to occur in the near future. These construction projects were designed to provide parking facilities and pathways for visitors to the sites.

Structure 1

Prior to excavation, the foundations of the walls were evident on the ground surface. The disclosure of the underground features began by clearing away fallen wall rock and modern refuse deposited by various visitors to the site over several years. Once the site was cleared of this debris, excavation proceeded from room to room.


R8W
13
North
4735
55 Miles to Tooele
Pony Express
Historic
Marker
5000
Res
Water Tank
Simpson
Springs
5097
4698
4810
4800
4873
18
24
76 Miles to Callao
4800
T9S
4966
5200
5400
5450
5600
5800
Simpson
25
5076
UTAH
QUADRANGLE LOCATION

map 1.
location of the
Simpson Springs Station

SIMPSON SPRINGS QUADRANGLE

SCALE 1:24000

1 ½ 0 1 MILE

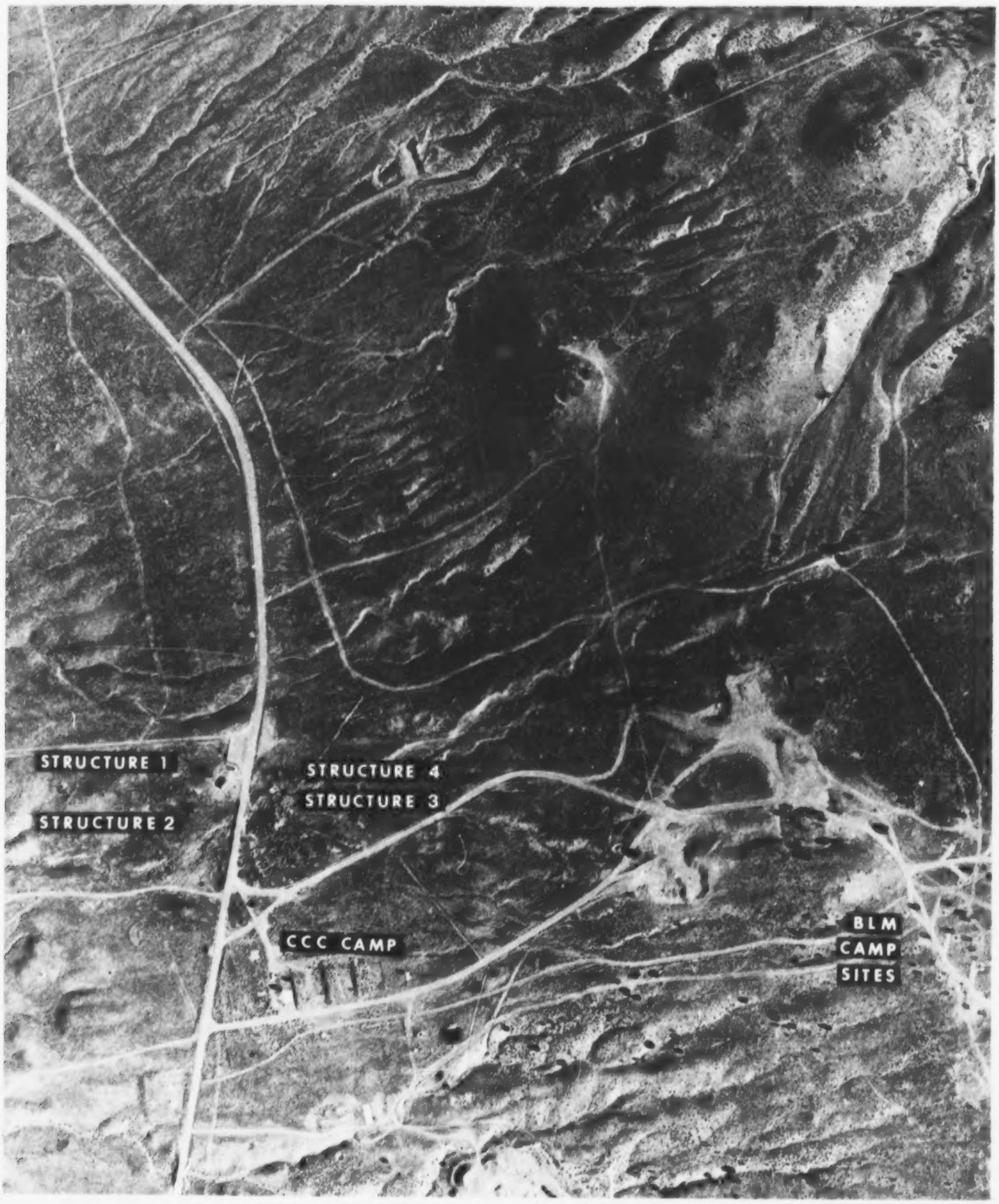
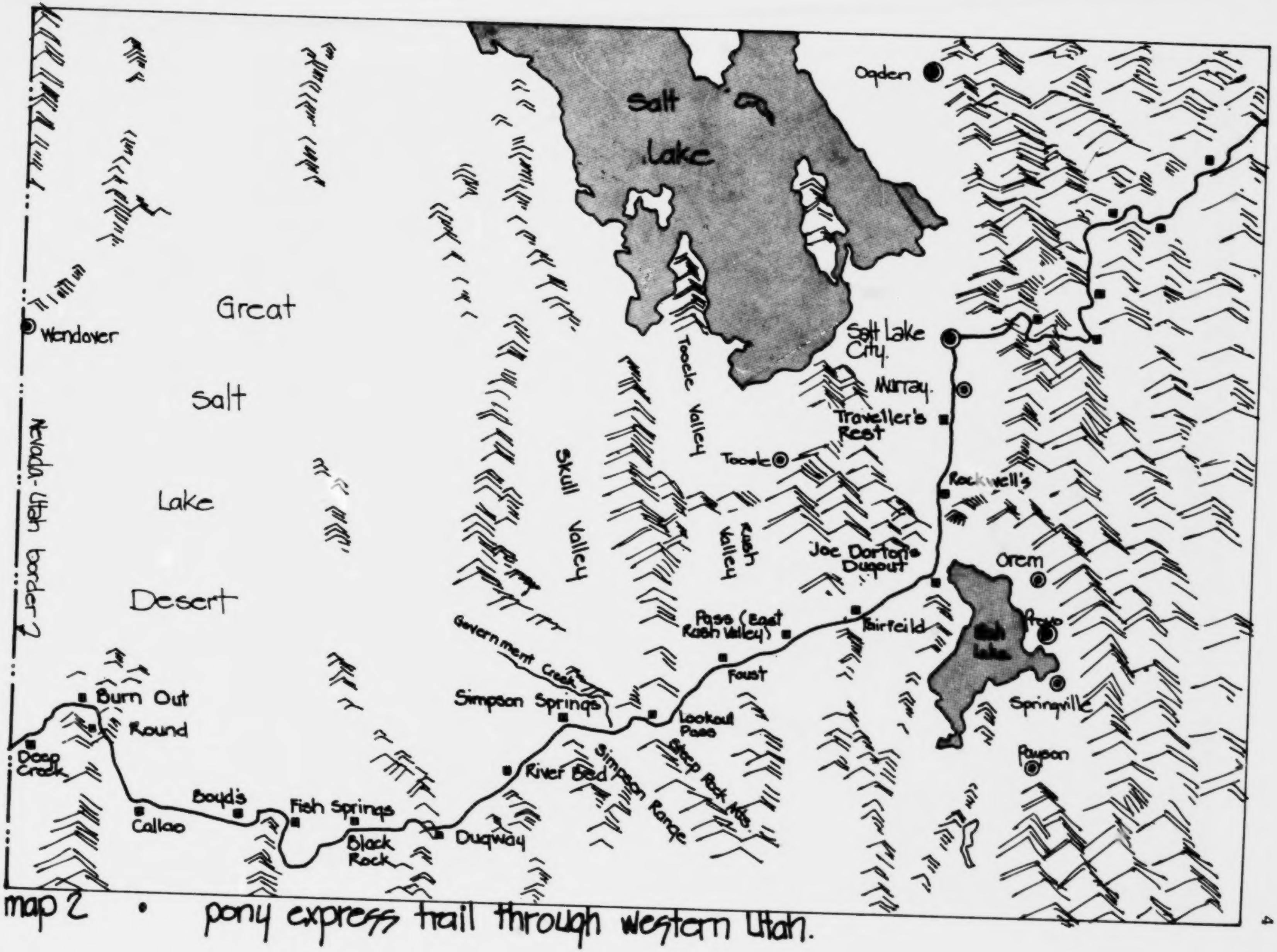

STRUCTURE 1
STRUCTURE 2
STRUCTURE 4
STRUCTURE 3
CCC CAMP
BLM
CAMP
SITES

Figure 1.
Aerial photograph of the Simpson Springs area with indications of sites and later developmental activities.


Ogden
Salt Lake
Great Salt Lake Desert
Wendover
Nevada-Utah border ?
Salt Lake City.
Murray.
Traveller's Rest
Tooele Valley
Tooele
Skull Valley
Rush Valley
Rockwell's
Joe Dorton's Dugout
Orem
Provo
Utah Lake
Springville
Payson
Fairfeild
Pass (East Rush Valley)
Faust
Government Creek
Simpson Springs
Lookout Pass
Sheep Rock Mts.
Simpson Range
River Bed
Dugway
Black Rock
Fish Springs
Boyd's
Callao
Burn Out
Round
Deep Creek

map 2 • pony express trail through western Utah.

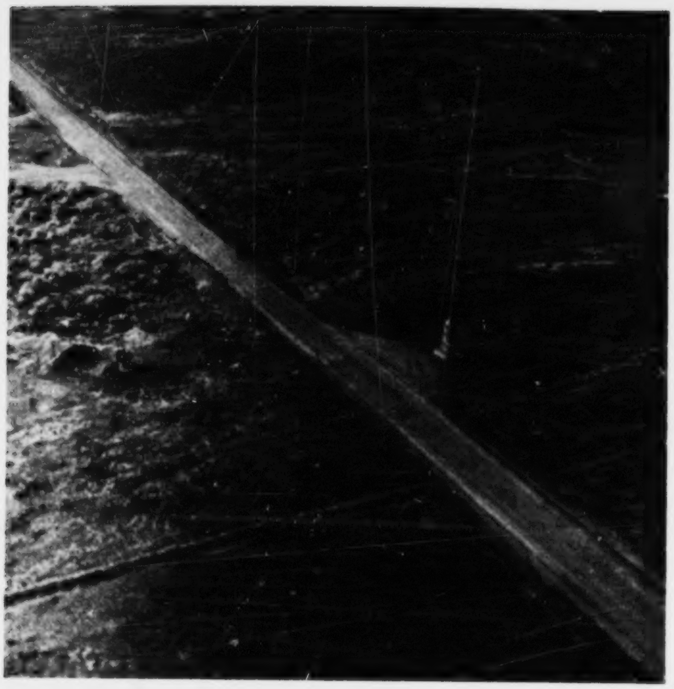


Figure 2.
Ruins at Simpson Springs marked with a monument.

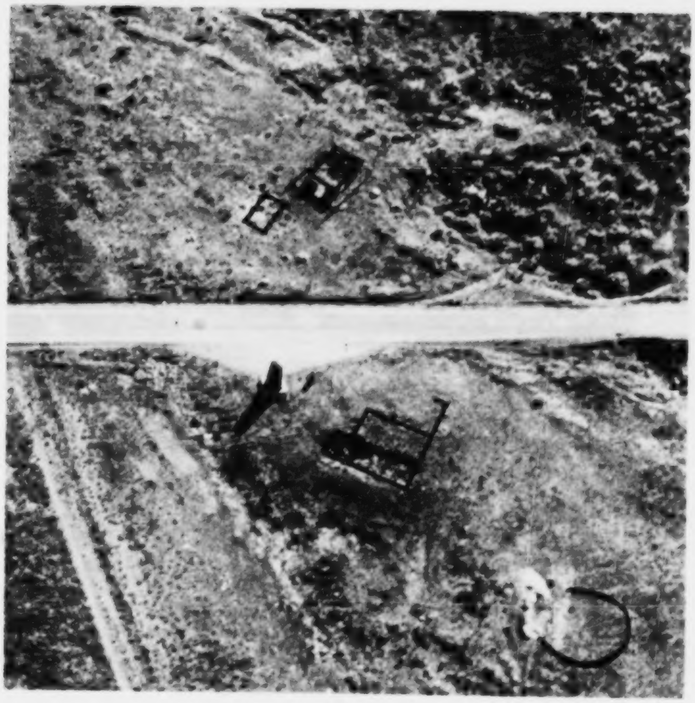
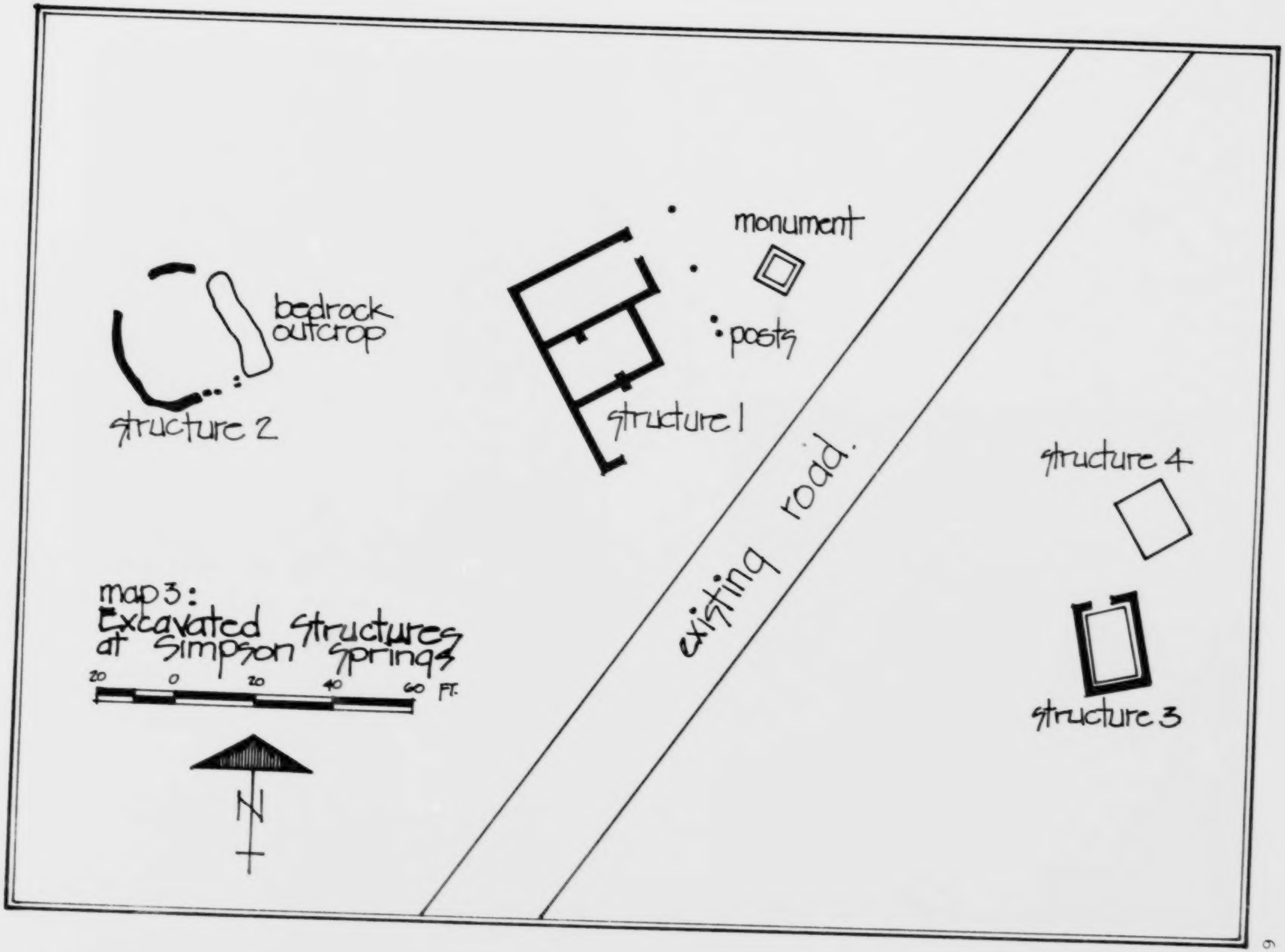


Figure 3.
Structures excavated at Simpson Springs.

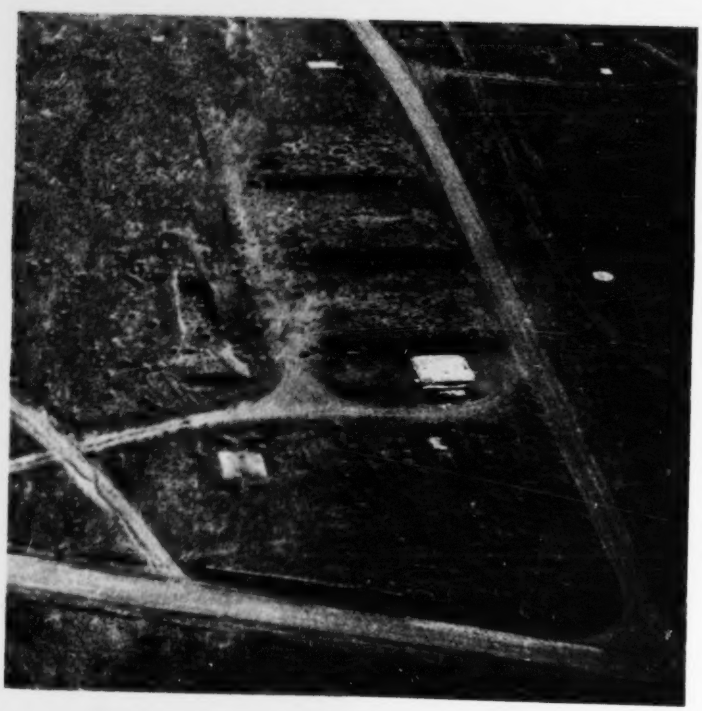


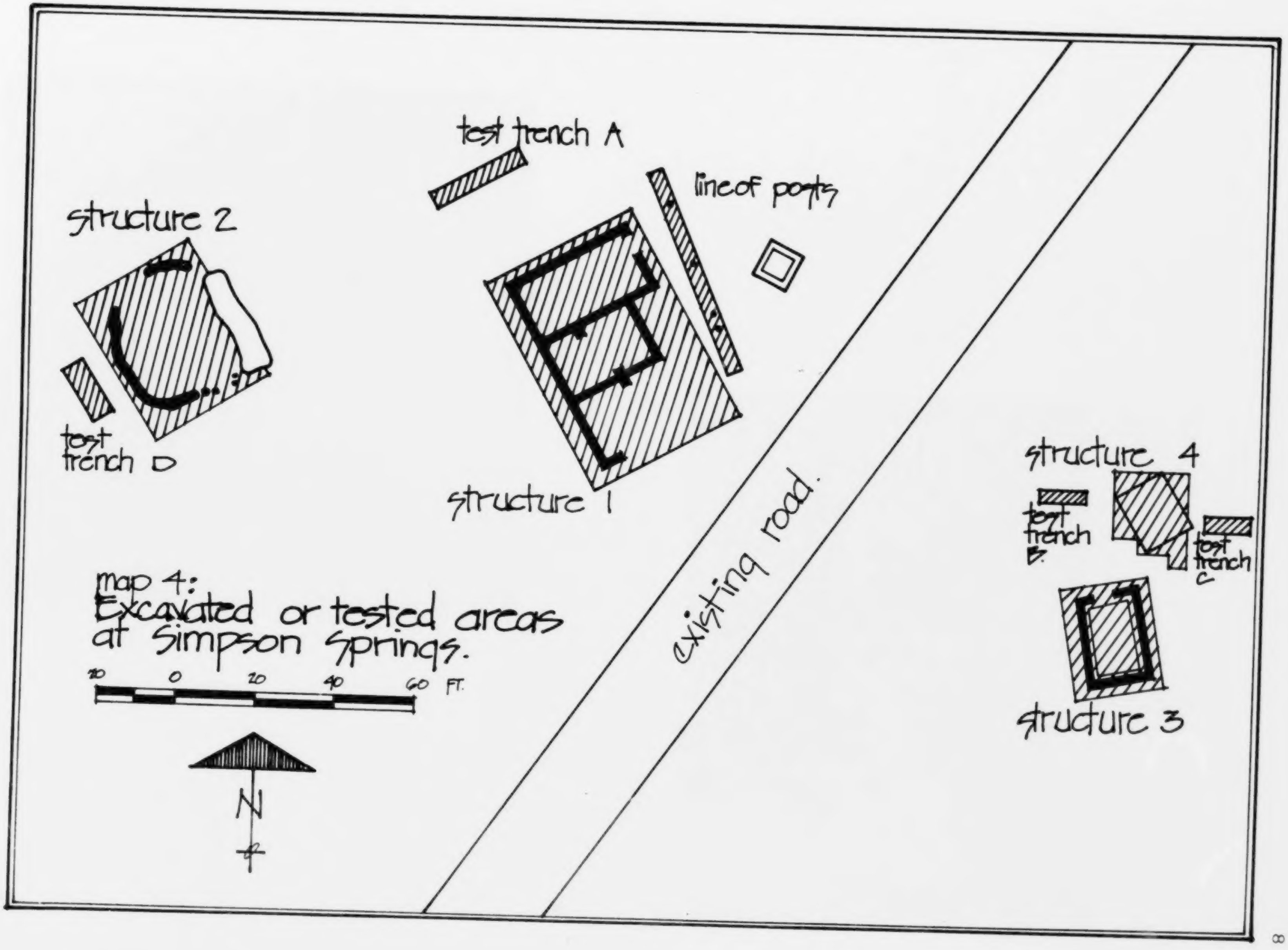
map 3:
Excavated Structures at Simpson Springs

bedrock outcrop
structure 2
monument
posts
structure 1
existing road.
structure 4
structure 3
20
0
20
40
60 FT.
N

Figure 4.
Structures 3 and 4 prior to excavation.

Figure 5.
Aerial photograph of the CCC camp.





map 4:
Excavated or tested areas at Simpson Springs.

structure 2
test trench D
test trench A
line of posts
structure 1
existing road.
structure 4
test trench B
test trench C
structure 3
20 0 20 40 60 FT.
N

The structure consisted of three rooms with an overall dimension of 51 feet by 33.3 feet (Map 5). The east and west walls were 28 degrees west of north (332°), and the north and south walls were 32 degrees south of west (238°). The wall foundations were not built precisely on a 90-degree angle.

Room 1. This room was the northern-most room. It was 33.3 feet long and 16.5 feet wide on the outside dimensions and 30.8 feet by 14.5 feet on the inside dimensions. This room was depressed about three feet below the others (Figure 6) and was reached from Room 2 by a narrow door two feet wide in the south wall (Figure 7). There was no indication of any steps. On the north end of this depressed room was a possible ramp which led outside (Map 5).

After fallen rock had been removed in Room 1, a thick layer of dung was revealed, ranging from three inches thick in the center of the floor to twelve inches thick along the walls.

The floor was hardened clay, with no evidence of having been covered with a floor joist and planks. Possibly the floor was once level with the adjoining room, and evidence of the flooring no longer exists. This would not explain the need for this room to be depressed, unless the area under the floor was used as a shallow cellar.

Artifacts from this room include the following:

Surface

1 iron hook
9 metal fragments
8 square nails
11 wire nails
1 bolt
1 horseshoe
5 horseshoe nails
2 stove parts
27 wire fragments
1 can opener (tin)
11 can fragments
2 .22 rimfire cartridges
1 centerfire cartridge
1 rimfire cartridge
1 .30-25 centerfire cartridge
152 animal bones
2 leather pieces
10 cloth fragments

Subtotal: 246

East Half

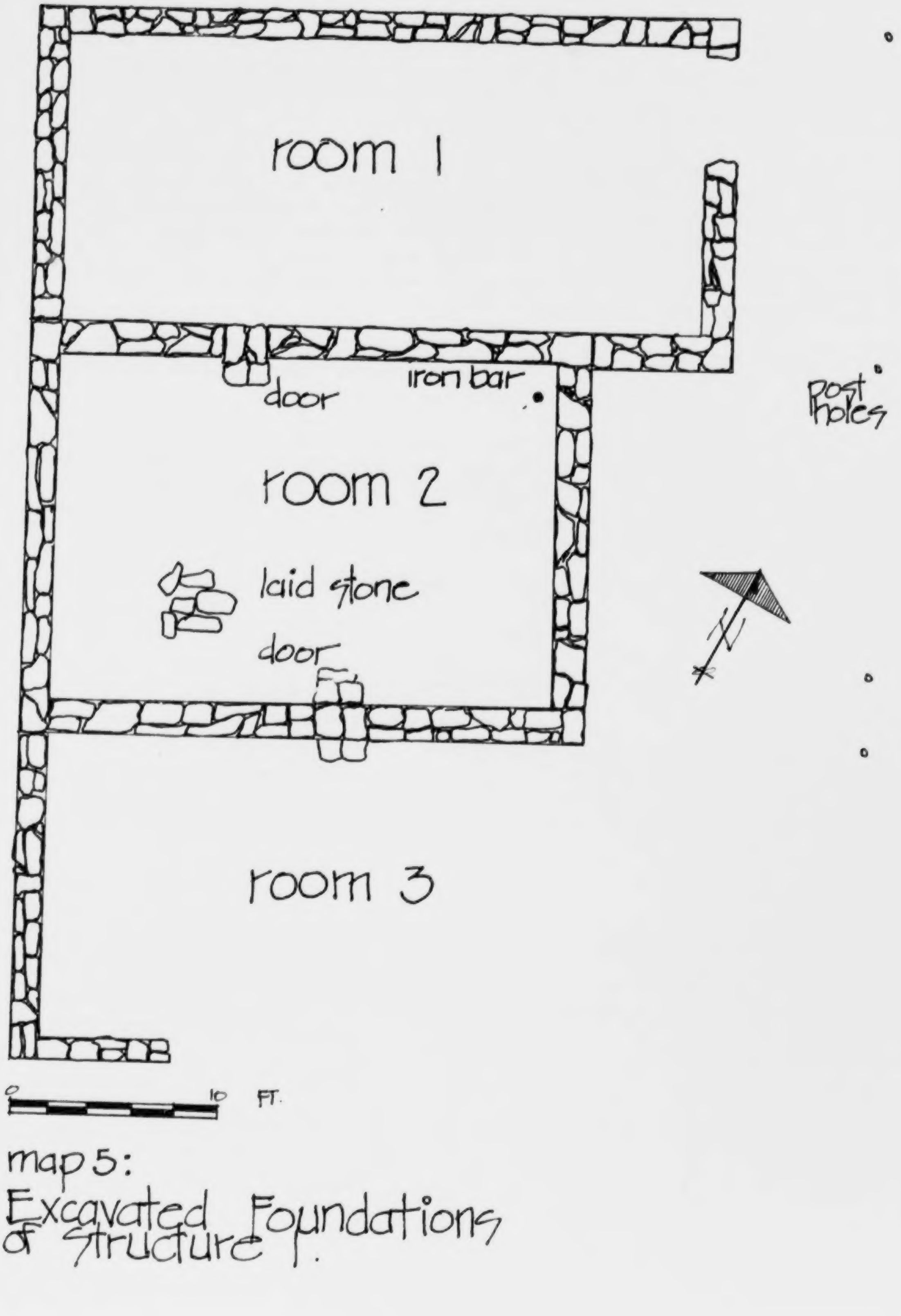
2 square nails
1 wire nail
2 .22 rimfire cartridges
6 animal bones

Subtotal: 11

South Wall

2 staples
2 belt buckles
8 wire fragments
6 wire nails
8 square nails
1 strap bolt
7 tin can fragments
11 cans
1 handle
1 .32 centerfire cartridge
1 .32 rimfire cartridge
3 .22 rimfire cartridges
5 wood fragments
38 animal bones
1 toothbrush head
8 leather pieces

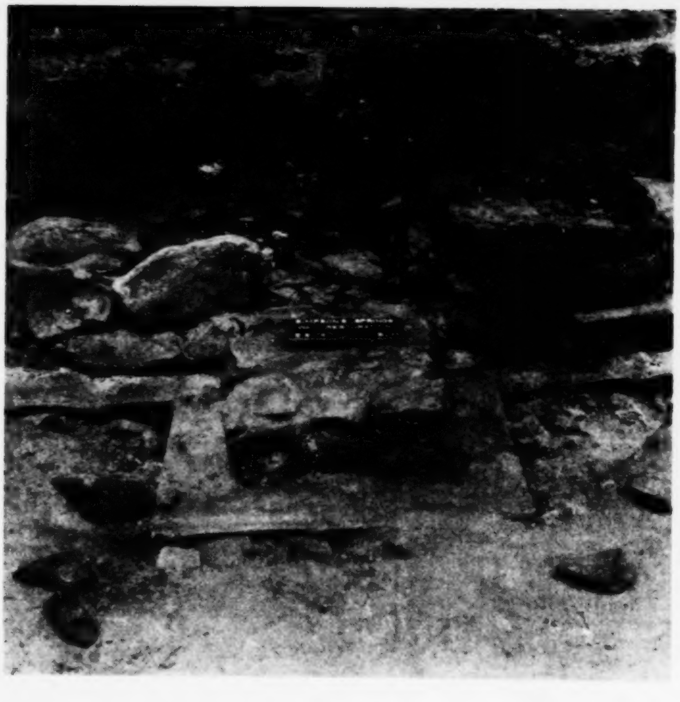
Subtotal: 103


room 1
room 2
room 3
door
iron bar
door
laid stone
post holes
N
0
10
FT.

map 5:
Excavated Foundations of Structure 1.

Figure 6.
Structure 1, Room 1, prior to excavation.

Figure 7.
Possible door between Rooms 1 and 2, Structure 1.



West Half

1 horseshoe
25 wire fragments
2 tin can tops
2 wood fragments
12 animal bones
1 leather piece

Subtotal: 43

North Wall

1 horseshoe
4 horseshoe nails
1 staple
6 square nails
38 round nails
2 stove fragments
93 wire fragments
13 tin can fragments
2 tin can lids
7 .22 rimfire cartridges
2 centerfire cartridges
10 wood fragments
28 animal bones
2 shoe heels
2 leather pieces
21 aqua plate glass fragments
1 glass bead
2 buttons

Subtotal: 245

TOTAL ARTIFACTS FROM ROOM 1 = 648

Room 2. This room was the center room of Structure 1 (Figure 8). It was 19 feet by 26.5 feet on the outside dimension and 16.3 feet by 22.3 feet on the inside dimension. Room 2 was the first section of the building to be constructed, since the walls of Rooms 1 and 3 abut to the middle room.

In the southwest area were several laid stones which could be the remnants of a stone floor or the footing for an iron stove. Much of the floor of the building was smooth, hardened clay, which may indicate that most of the floor was clay and only a small section was laid stone, probably for a stove.

As in the north wall, there seemed to be a doorway in the south wall, 2.1 feet wide. Considerable window glass was found along the east and west walls, suggesting windows in these areas.

In the northeast corner of this room was unearthed an iron bar which had been buried or driven into the soft bedrock almost two feet. This bar may have been a ground for a telegraph key, since early types of insulators were found in this room also.

Figure 8.
Structure 1, Room 2, prior to excavation.

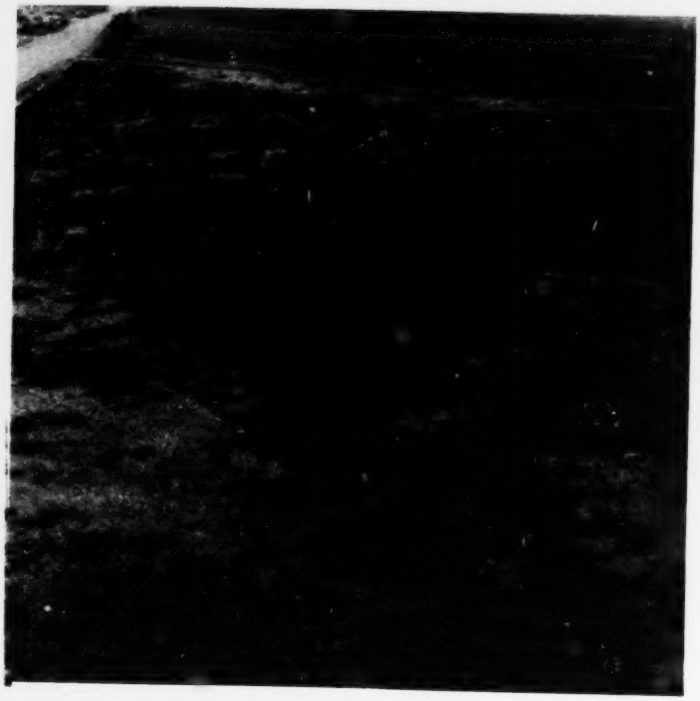


Figure 9.
Structure 1, Room 3 prior to excavation.

Artifacts found in Room 2 include:

1 flat iron bar
1 horseshoe
1 staple
1 hexagonal nut
5 stove fragments
84 wire fragments
4 insulator bolts
1 buckle
24 square nails
17 wire nails
1 tin can
1 tin can top
6 .22 rimfire cartridges
3 rimfire cartridges
1 centerfire external cartridge
2 knife handles
168 animal bones
3 shoe soles
2 straps
1 heel
8 fragments
292 aqua window glass fragments
1 button

TOTAL ARTIFACTS FROM ROOM 2 = 628

Room 3. This was the southernmost room of the three rooms in Structure 1 (Figure 9). Very little is known about this room, since most of it has been destroyed. Only the west wall was intact and a section of the south wall remained. The west wall was 15.7 feet long on the outside and 14.4 feet wide on the inside.

Artifacts found in Room 3 include:

1 large staple
1 square nut
21 wire fragments
6 wire nails
1 horseshoe nail
3 square nails
1 tin can top
1 .22 rimfire cartridges
1 rimfire cartridge
30 animal bones
1 leather strap
1 shoe top
3 purple bottle body fragments
1 purple bottle finish
1 green bottle finish
1 brown bottle base
1 clear bottle base
30 purple bottle fragments
23 green bottle fragments
10 brown bottle fragments
10 aqua bottle fragments
8 clear bottle fragments

TOTAL ARTIFACTS FROM ROOM 3 = 156

TOTAL ARTIFACTS FROM INSIDE STRUCTURE 1 = 1,432

Structure 1 was constructed mainly of field stone from outcroppings of a late Pre-Cambrian quartzite and a green Tertiary volcanic tuff found throughout the area (Figures 10 and 11). The walls of Rooms 1 and 2 ranged from 12-24 inches in thickness. The stone used in this structure was semi-dressed. It had been smoothed off somewhat on two sides, resulting in a more or less even wall surface.

Artifacts found during excavation around the outside of Structure 1 included:

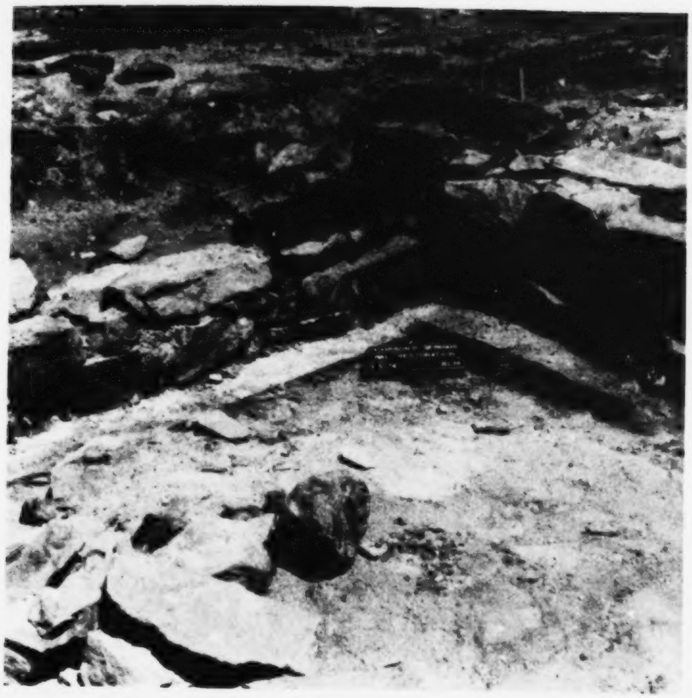


Figure 10.
Original stone wall of Structure 1 and cement stabilization.

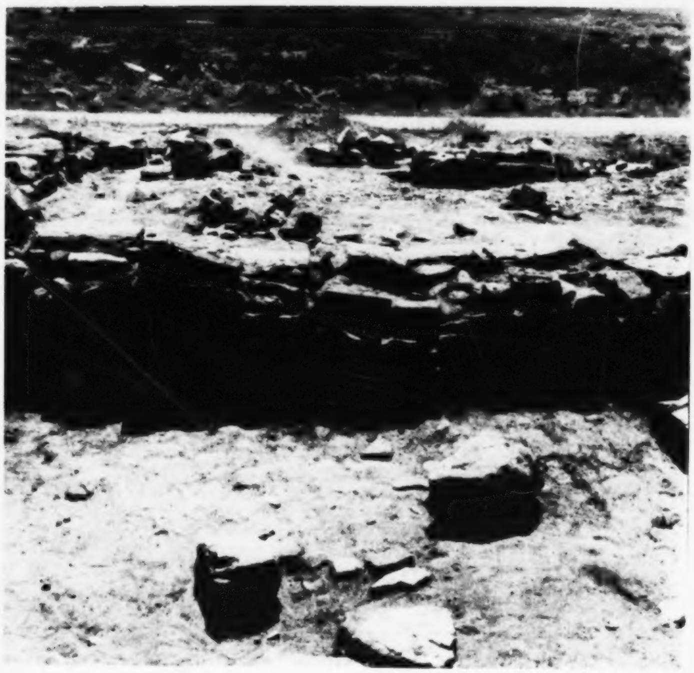


Figure 11.
Original stone walls of Structure 1.

North of Structure 1

1 snap hook
1 hook
2 metal fragments
16 ironstone fragments
4 animal bones
2 aqua bottle bodies
1 brown bottle finish
5 brown bottle fragments
5 green bottle fragments
13 aqua window fragments
1 white button

Subtotal: 51

South of Structure 1

3 cast iron stove fragments
6 ironstone fragments
1 centerfire cartridge
1 brown bottle neck
1 white bottle base
22 purple bottle fragments
11 aqua bottle fragments
4 green bottle fragments
1 brown bottle fragment

Subtotal: 50

Outside North Wall

1 purse frame
1 wire fragment
1 charred beam
15 bones
7 shoe fragments
1 shoe heel

Subtotal: 26

Line of Posts. A trench was excavated in front of the Pony Express station located on the west side of the road near the monument. Posts found in this trench lay parallel to the east wall of the structure at a distance of 4.6 meters. The three posts were 4.6 meters and 9.2 meters apart, respectively. It was thought that the posts would be 4.6 meters apart, but no indication of a post was found in the middle of the widest gap. Wooden posts 12 to 13 centimeters in diameter were found in the three holes. Artifacts recovered from these post holes included:

1 wire nail
1 knife blade
1 ironstone fragment
1 amber bottle glass fragment

Subtotal: 4

TOTAL ARTIFACTS FROM OUTSIDE STRUCTURE 1 = 131

Structure 2

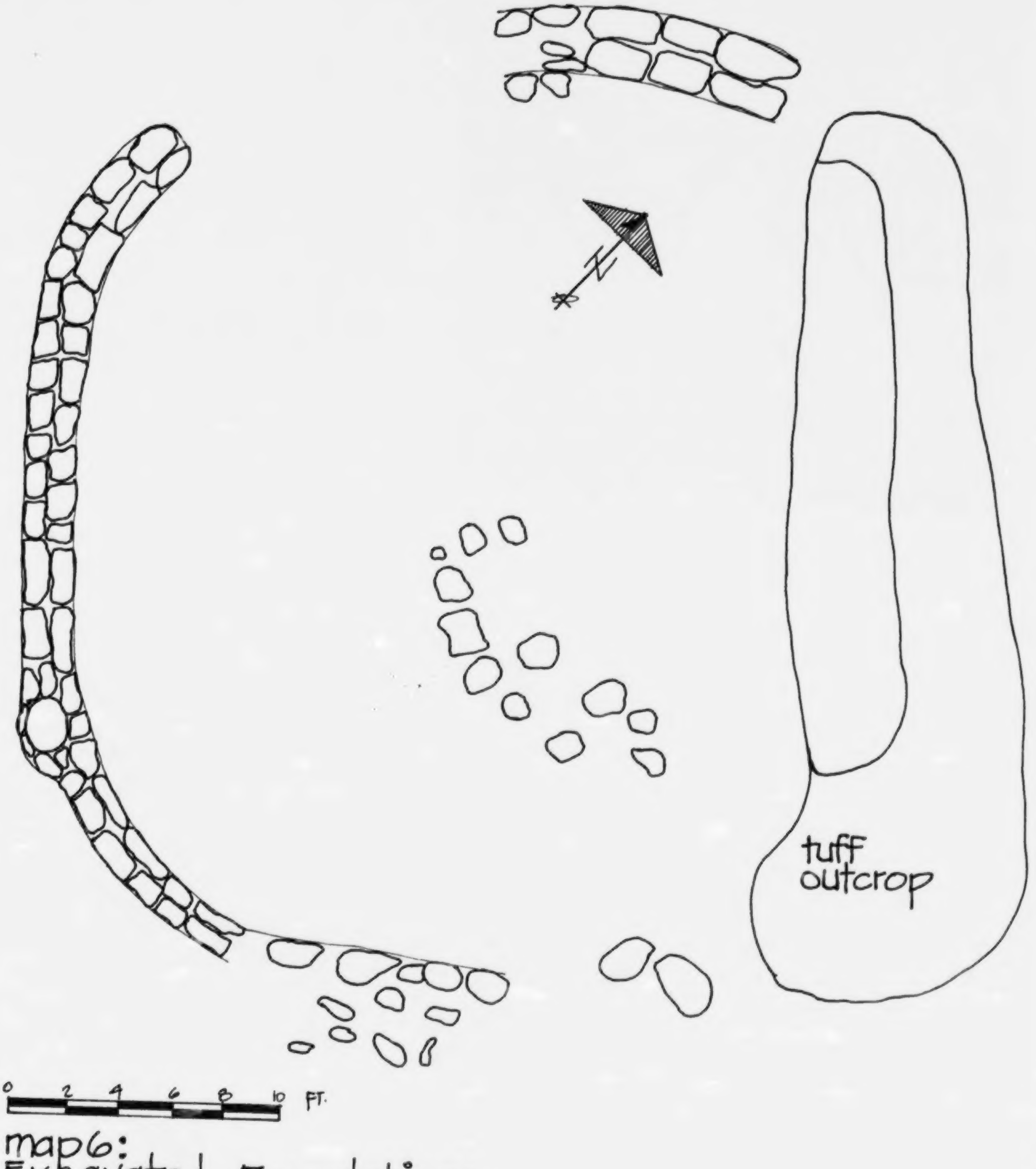
Structure 2 was located 100.2 feet at 267 degrees north of the datum point at Structure 1. Prior to excavation at Structure 2 there existed a loosely defined outline of a stone foundation (Figure 12). The north end of the structure was an outcropping of green volcanic tuff. The inner side of the foundation appeared hewn down. The foundation stones were laid in a somewhat circular fashion (Map 6). A cultural layer was encountered just under the ground surface (Figure 13).

The wall on the west side of the structure no longer existed. This may have been an entrance, or the wall may have eroded away here, or the stones may have been removed some other way.

The floor of this structure was dirt. There were a few stones in the center of the floor, but what they were used for is not known at this time.

Figure 12.
Structure 2 prior to excavation.

Figure 13.
Structure 2 after excavation.


N
tuff outcrop
0 2 4 6 8 10 FT.

map6:
Excavated Foundations of Structure 2

Artifacts from this structure included the following:

8 square nails
1 harness ring
1 hexagonal bolt head
1 square nut
1 knife blade
2 horseshoe pieces
1 staple
1 iron fragment
32 can fragments
19 ironstone sherds
1 earthenware sherd
1 rimfire cartridge
4 centerfire internal cartridges
3 wood pieces
60 animal bones
4 leather pieces
36 green bottle fragments
5 aqua bottle fragments
3 brown bottle fragments
27 purple bottle fragments
14 clear bottle fragments
5 black bottle fragments
2 window glass fragments
3 blue insulator pieces

TOTAL ARTIFACTS FROM STRUCTURE 2 = 235

The structure was somewhat oval-shaped, since the north wall measured 9.9m, the south wall measured 11.9m, the west wall measured 7.6m and the east wall measured 9.7m (Figure 14).

It was thought at first that this structure was a corral associated with the station. However, the lack of manure or horse trapping seemed to negate this explanation. Possibly a better explanation for this structure is that this circular stone outline was the footing for a Sibley tent.

In 1859, J. H. Simpson, a young lieutenant, explored this western region for a wagon road, and while camped at Simpson Springs (named after the lieutenant), his group used a Sibley tent "set upon a circular stone wall" (Simpson, 1876).

Structure 3

Structure 3 was located 121 feet at 136 degrees north from datum point to the northwest corner. This structure still had standing walls approximately one foot thick, although badly eroded (Figure 15). The walls were made of local stone with a tuff and clay mortar on a cement footing (Figure 16, 17, and 18). The building was rectangular in plan, with the length of the building a few degrees off a north-south axis (Map 7).

The outside dimensions of the upper walls were 15 feet by 22.5 feet, while the inside dimensions were 13 feet by 20.6 feet. There were slight variations to the wall measurements, since the structure was not perfectly square. Entrance into the structure was through a doorway 3.3 feet wide in the north wall.

The floor of Structure 3 was sunken 14 inches below the bottom of the walls (Figure 19). The floor was made from railroad ties laid on a hard clay surface (Figure 20). There were 17 ties in the south half of the building. Thirteen were laid east-west from the west wall and four were laid north-south from the south wall. These ties showed

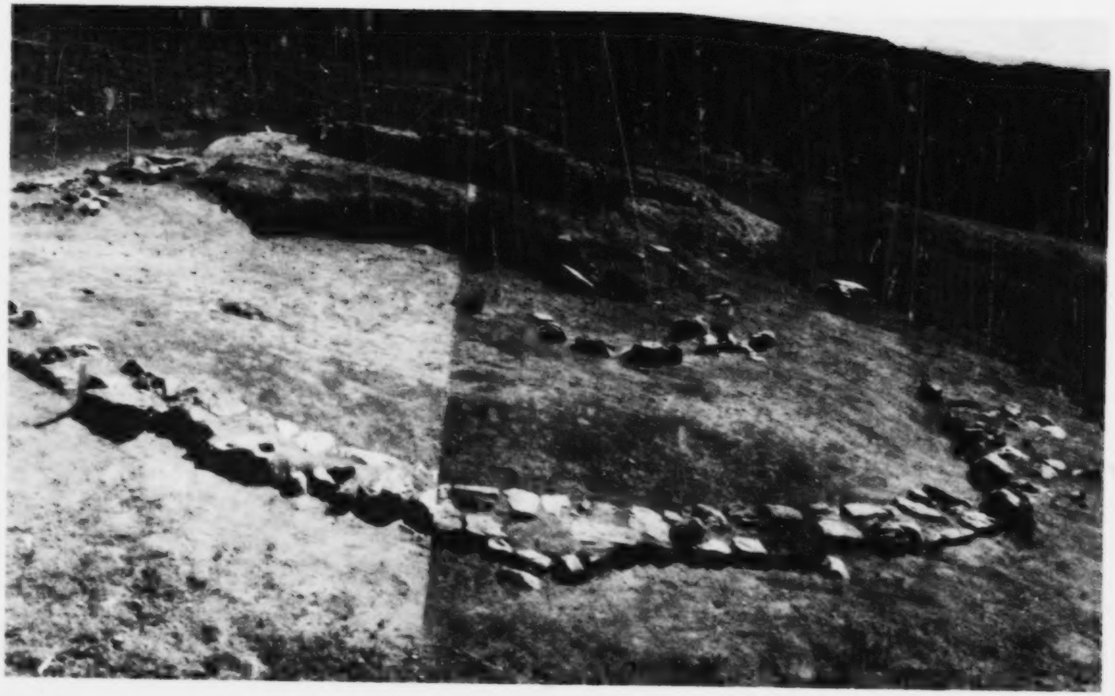


Figure 14.
Floor and excavated foundations
of Structure 2.

Figure 15.
Structure 3 prior to excavation.

Figure 16.
Construction detail of the walls, Structure 3.

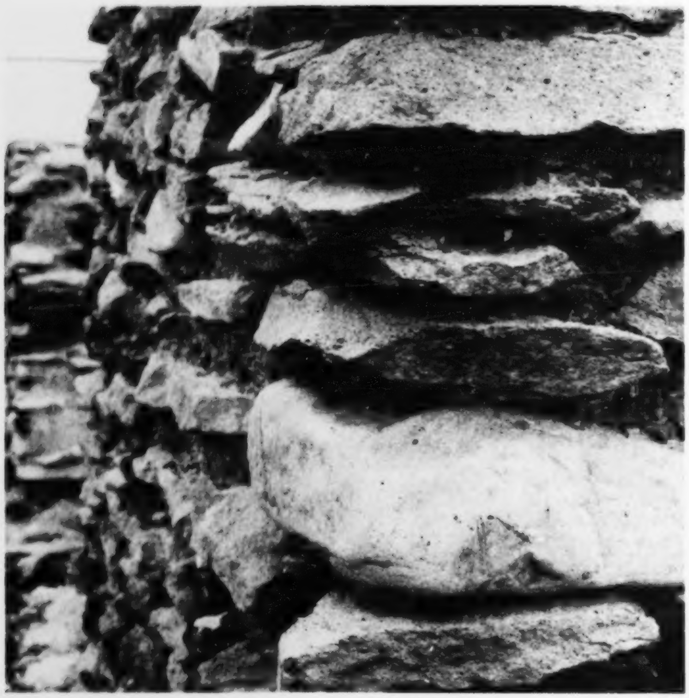
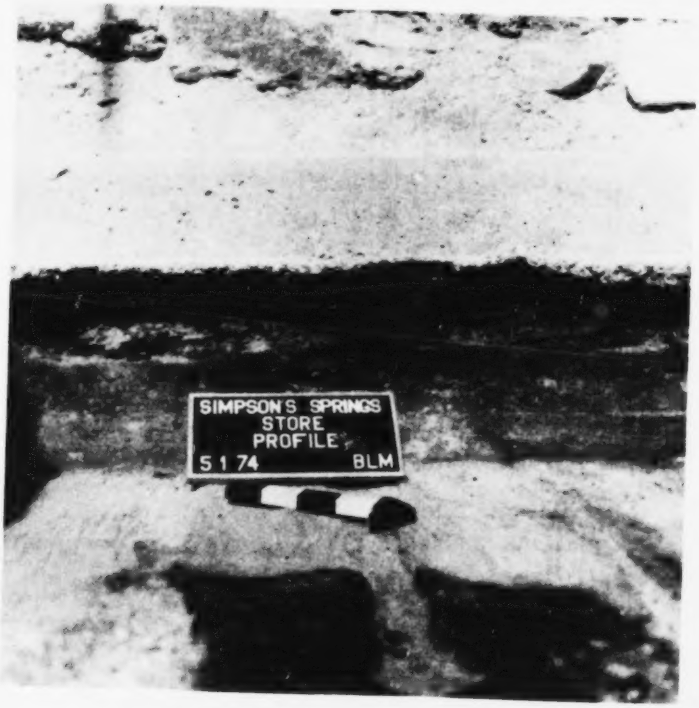


Figure 17.
Wall construction and plaster remnant, Structure 3.

Figure 18.
Cement footing below recent stabilization cement.



SIMPSON'S SPRINGS
STORE
PROFILE
5 1 74
BLM

considerable evidence of burning (Figure 21). Pieces of burned log were found on top of the ties. Originally, they may have been part of the roof support system.

A fragment of a sign was found on the floor. Only the word "Utah" remained intact (Figure 22). Some of the ties were stamped with the letter."P9" and three had date nails in them (Figure 23), and number "23" embossed on the nail head. These nails were used to control the date the ties were laid in the track, in this case 1923.

Artifacts recorded in Structure 3 included:

21 stove fragments
7 staples
2 railroad spikes
1 pocketknife frame
2 horseshoe fragments
229 round nails
3 date nails
13 can pieces
2 .22 rimfire cartridges
6 centerfire cartridges
9 ironstone sherds
1 section of a barrel top
1 sign fragment (Utah)
Several cedar poles
17 railroad ties
Several burnt logs (beams)
27 bones
1 bottle fragment
151 aqua window glass

TOTAL ARTIFACTS FROM STRUCTURE 3 = 493

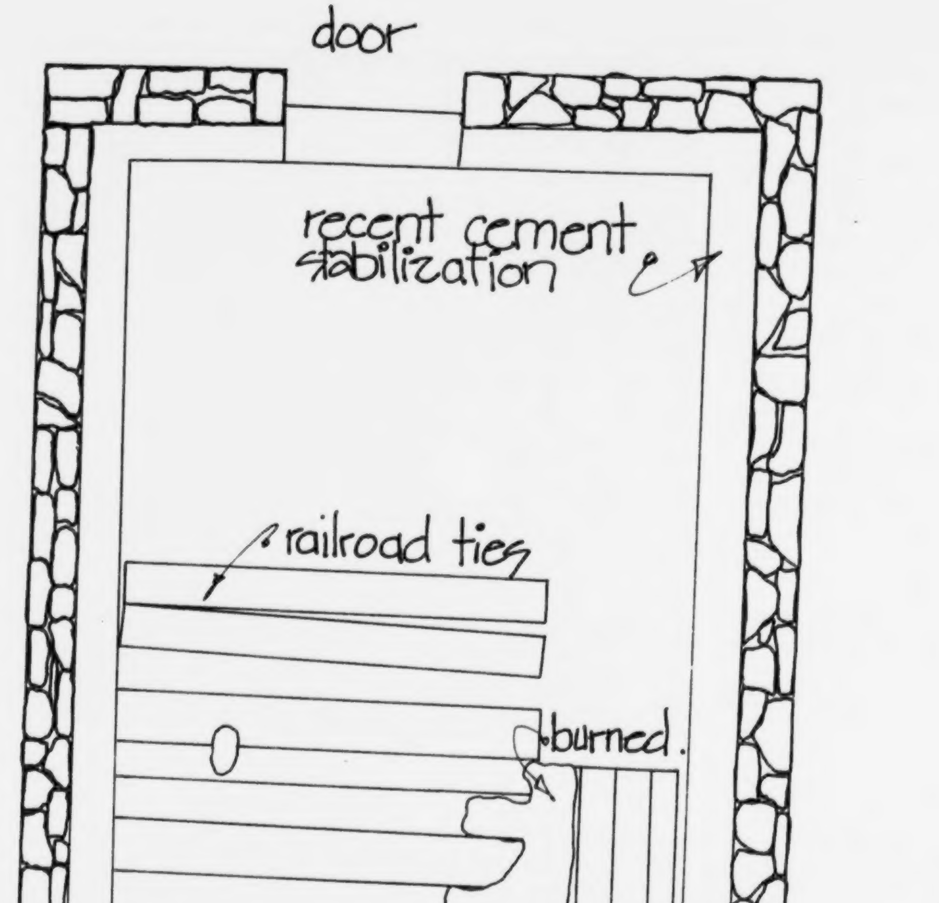
Structure 4

At the beginning of excavation in this area, Structure 4 was a large depression measuring 6m north-south and 7.5m east-west (Figure 24). The area was cross-trenched with a considerable number of artifacts recovered from each trench. It was not until near completion, when approximately 15 feet square was dug to a depth of 3 feet, that architectural features could be discerned (see cross-section C-D in Map 9).

When the dirt fill was cleared, no foundations were found, but an area 10 feet by 15 feet (Map 8) was unearthed that had been excavated into the natural gravel and tuff bedrock (Figures 25 and 26). The longer length of the intrusion ran in a northwest-southeast direction.

In the west corner of this rectangular depression was an even deeper pit (see cross section A-B in Map 8), measuring 3 feet by 2.2m and 1.45m deep from the floor level of the depression, or 2.5m from the present ground surface (Figure 27). Water filled the hole in 12 to 15 hours.

A considerable number of artifacts were recovered from the excavation of Structure 4. The quantity suggested that the depression was used as a trash dump. The lack of construction material seemed to indicate that if a structure had been framed in the hole, it had been disassembled before the deposition of trash. Artifacts included the following:


door
recent cement stabilization
railroad ties
burned.
roof beam.
burned.
0
5 FT.
N

map7:
Excavated Foundations and floor features of Structure 3.

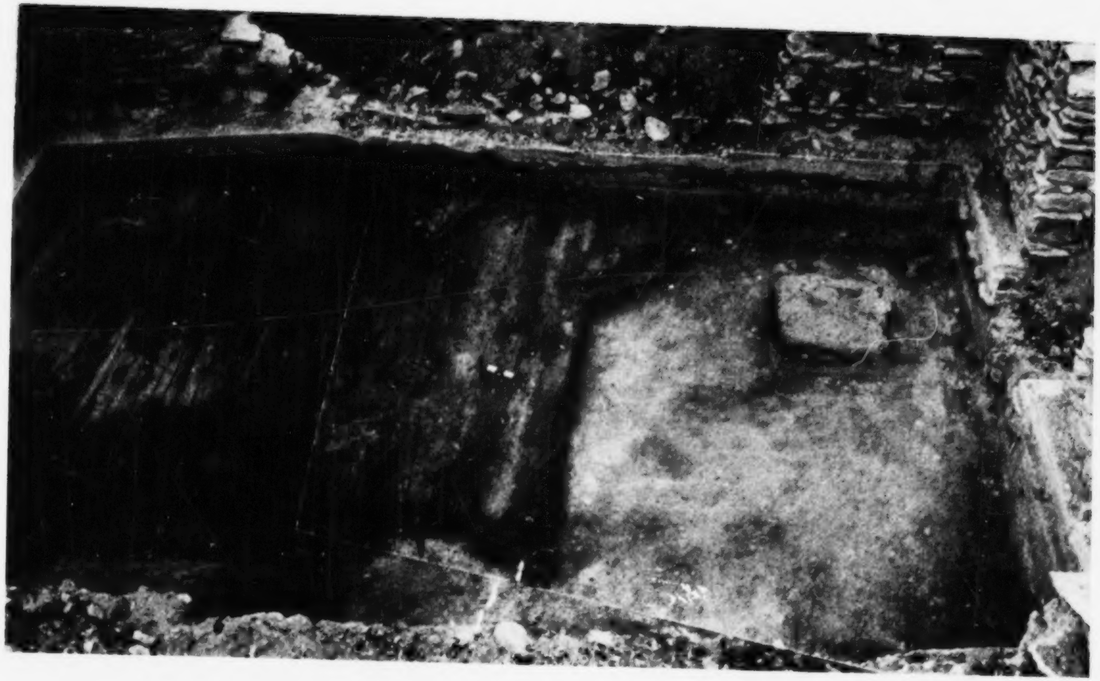


Figure 19.
Structure 3 after excavation.

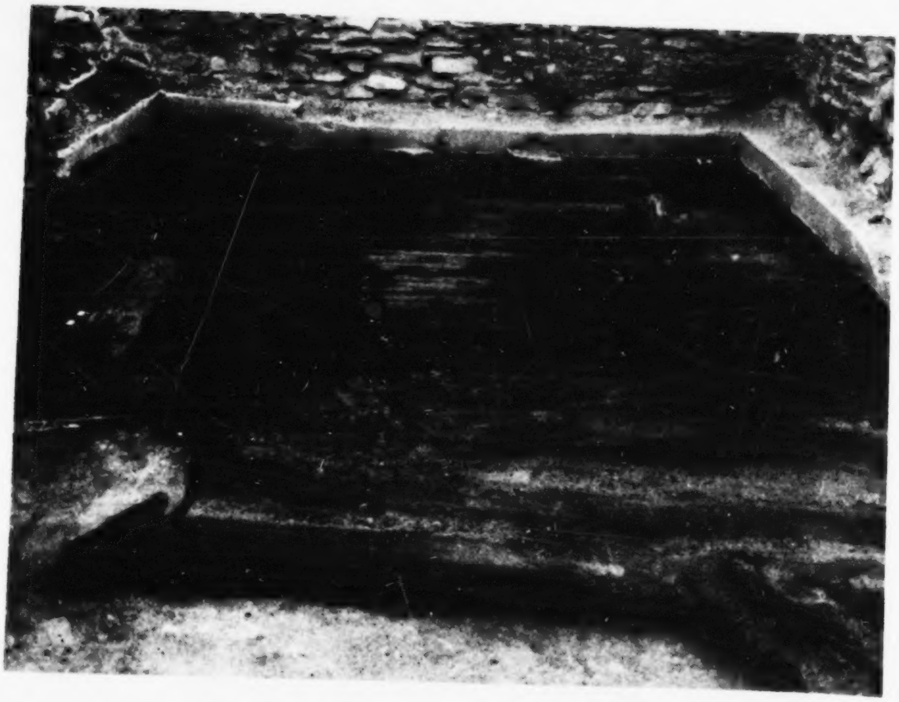


Figure 20.
Railroad tie construction of the floor, Structure 3.

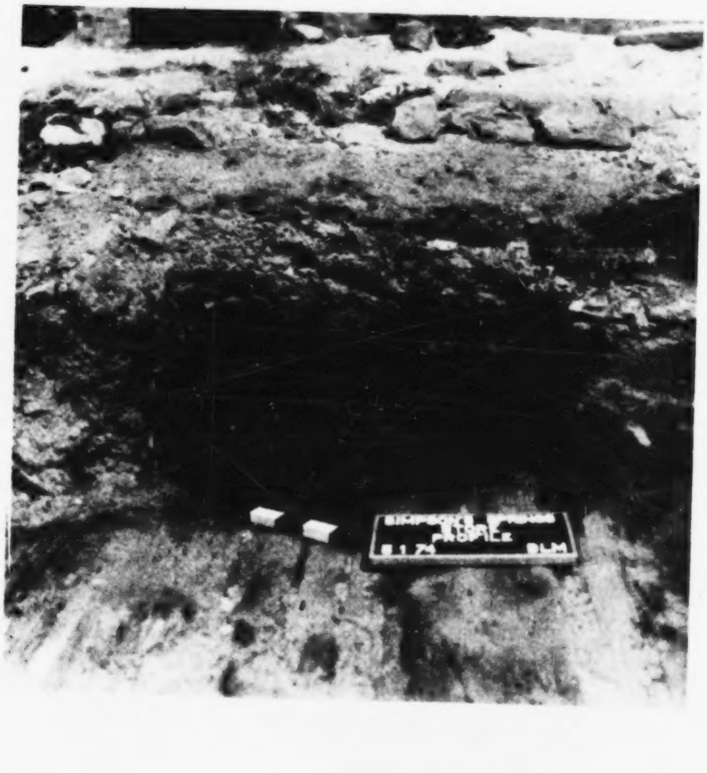


Figure 21.
Evidence of floor burning in Structure 3.

Figure 22.
Sign found on the floor of Structure 3.

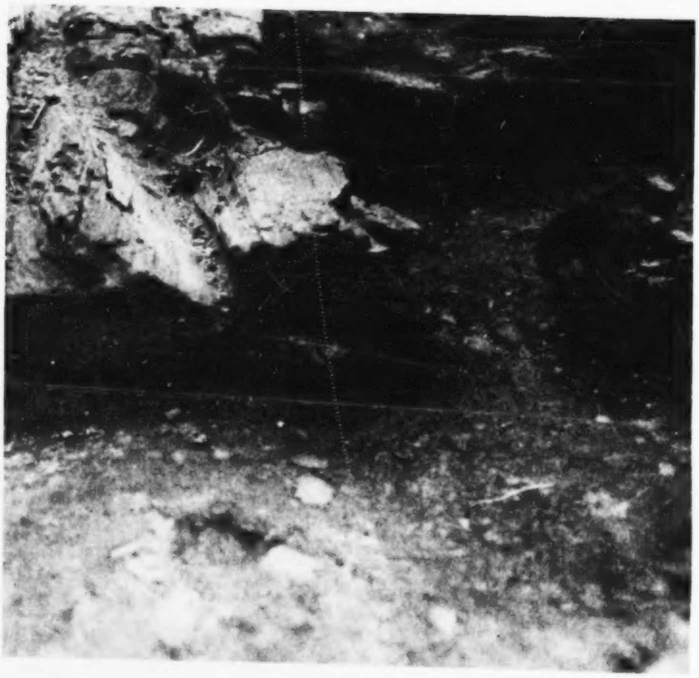
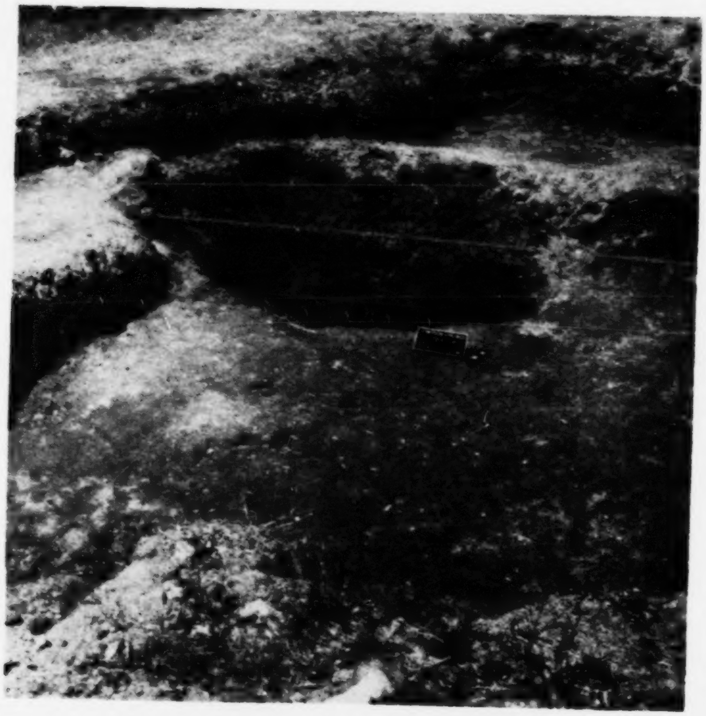


Figure 23.
Stamped letters on the end of a floor tie, Structure 3.

Figure 24.
Structure 4 prior to excavation.

Figure 25.
Intrusion in undisturbed soil, Structure 4.



177 round and square nails
1 sardine can piece
1 fork
2 harness rings
1 spring
3 buckles
7 bolts
5 pie tins
4 strap pieces
3 horseshoe pieces
1 windlass wheel
3 rod pieces
1 chain link
1 sardine can key
2 pocket watch pieces
5 table knife handles
322 plain ironstone fragments
61 decorated ironstone fragments
2 bottle caps
13 buttons
16 earthenware sherds
400 green bottle glass fragments
295 blue bottle glass fragments
351 amber bottle glass fragments
207 purple bottle glass fragments
1468 clear bottle glass fragments
Cloth
25 whole bottles
125 window glass fragments
18 porcelain lid liners
1 syringe tube
1 bottle stopper
503 animal bones
1 dog skull
1 dog skull with jaws
30 wood fragments
53 leather fragments
116 wire pieces
331 can pieces
12 zinc jar lids
22 cartridge cases
2 knife pieces
5 link bracelet pieces
1 shackle
1 fastener
1 zinc jar ring piece
1 hatchet handle
1 railroad spike
3 grommets
1 watch bob piece
1 unknown
1 egg shell
Charcoal

TOTAL ARTIFACTS RECOVERED FROM STRUCTURE 4 = 4,609

Test Trenches

Test Trench A. On the north side of Structure 1 and sloping into a small wash was an area that looks like a refuse area. A small trench was placed in this section of the site. The following artifacts were recovered:

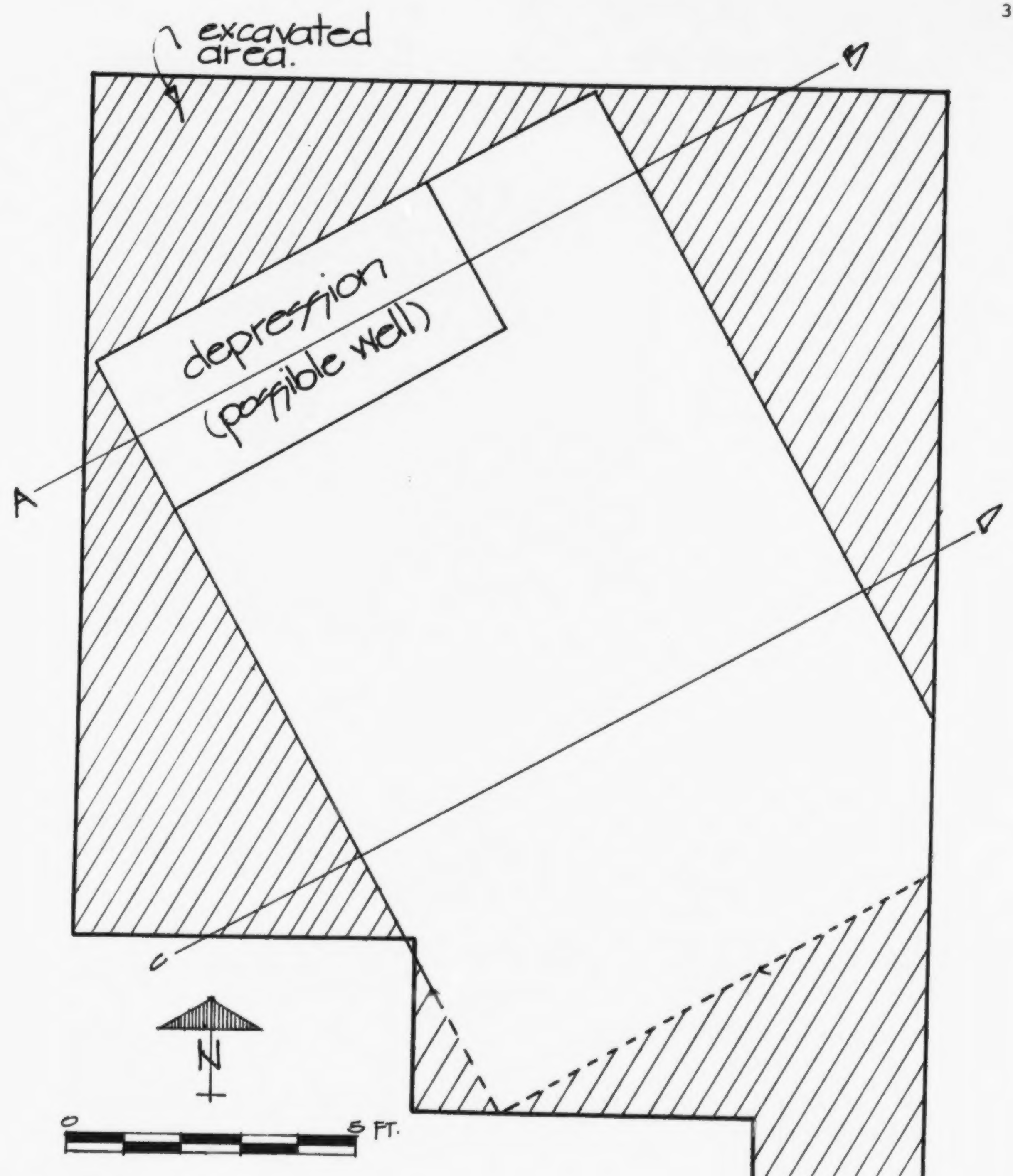
1 strap iron
1 horseshoe
11 tin cans
48 animal bones
1 leather strap with buckle
1 leather fragment

TOTAL ARTIFACTS RECOVERED FROM TEST TRENCH A = 63

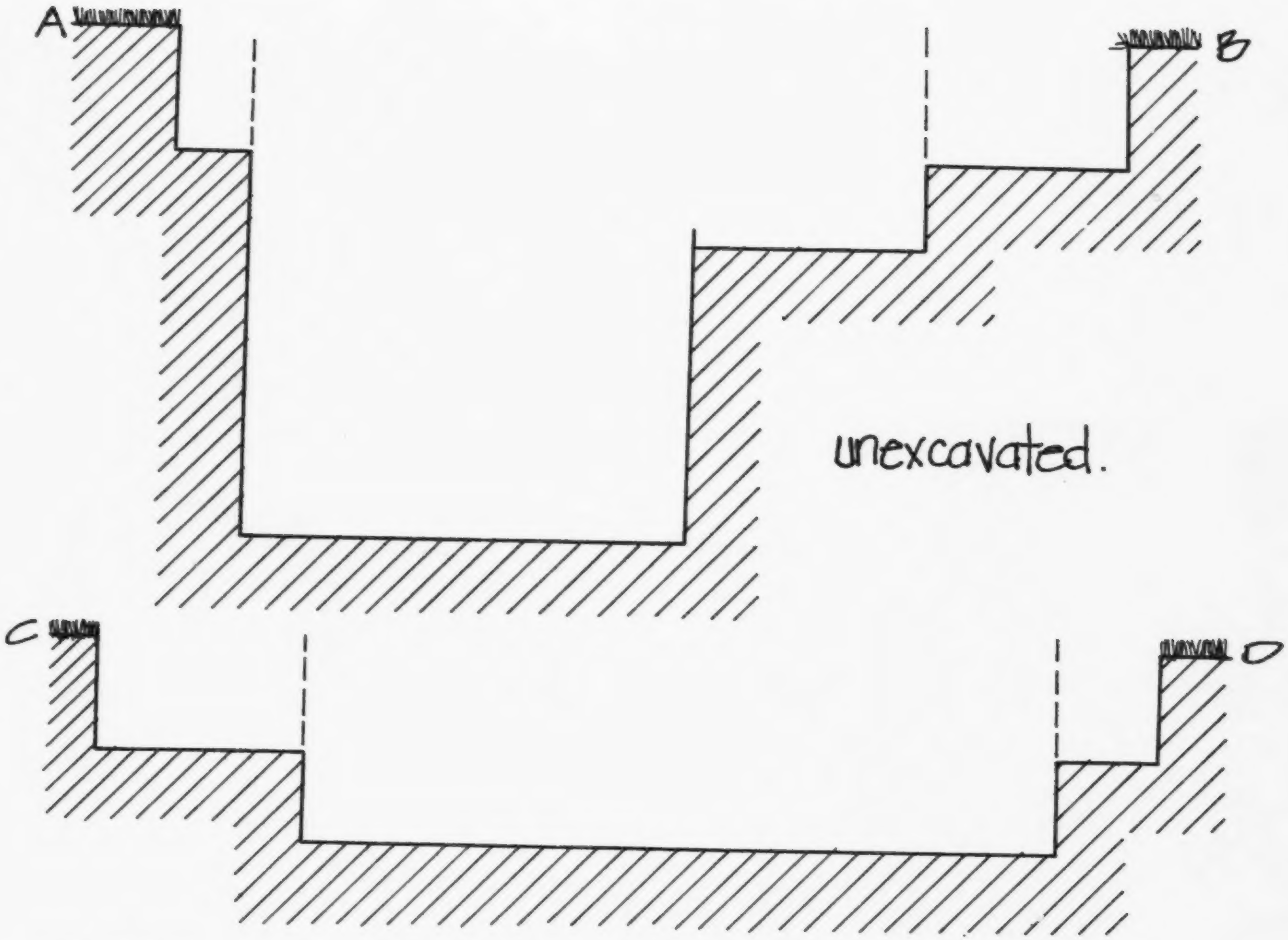
Test Trench B. A trench was placed through a small depression located approximately 4 meters east of Structure 4. No evidence of a structure or soil disturbance was revealed during the excavation. However, some surface artifacts were encountered.

37 metal fragments
27 cone fragments
3 leather fragments
68 green bottle glass
57 amber bottle glass
42 purple bottle glass
46 clear bottle glass
2 window glass fragments
3 wood fragments
9 ironstone sherds
1 earthenware sherd

TOTAL ARTIFACTS FROM TEST TRENCH B = 295


excavated area.
depression (possible well)
A
B
C
D
N
0
5 FT.

map 8:
Outline of Excavated Features – Structure 4.


A
B
unexcavated.
C
D

map 9:
Cross-Section Profiles
of Structure 4.

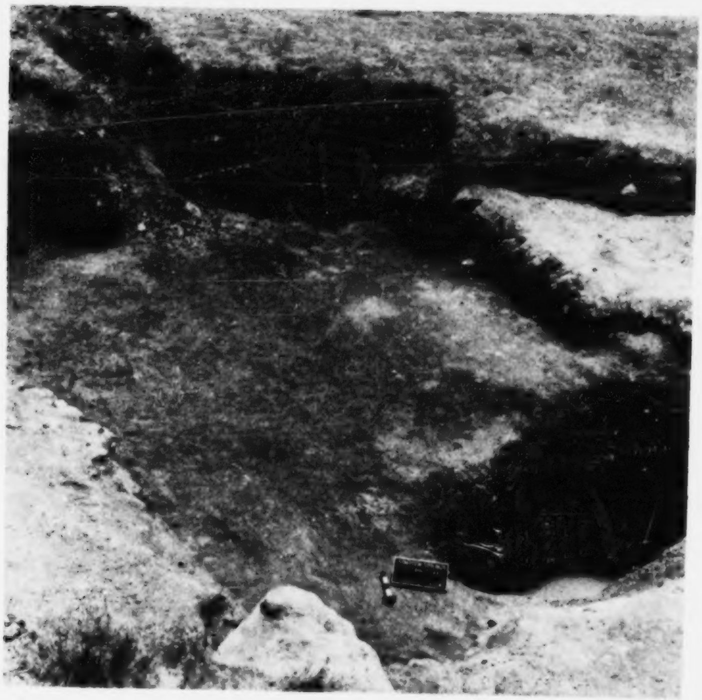
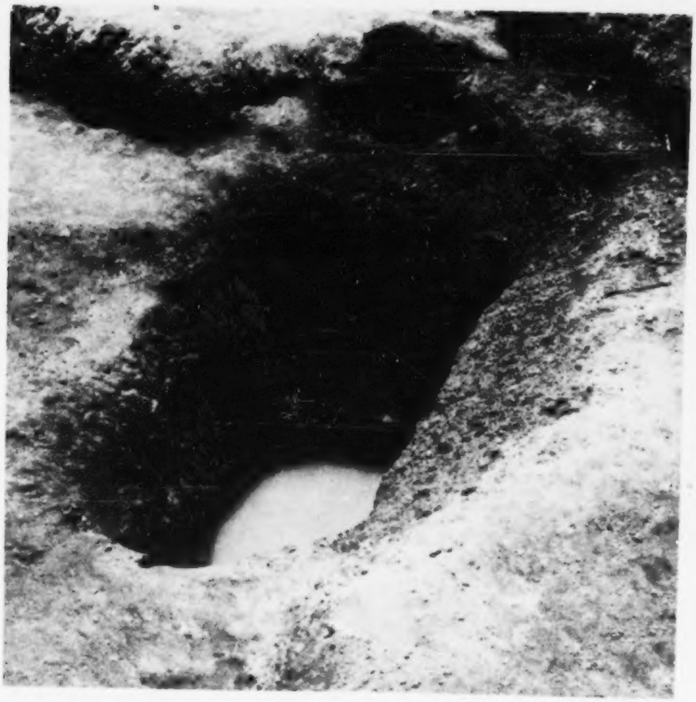


Figure 26.
Intrustion into natural soils, Structure 4.

Figure 27.
Deep intrusion, possibly a well, into the floor of Structure 4.



Test Trench C. Another trench was excavated through a probable trash area southwest of Structure 2 (Map 3). No specific area of concentration could be determined nor could a discernable man-made pattern of disturbance be detected. Artifacts included:

4 square nails
11 wire nails
14 can fragments
1 horseshoe
24 animal bones
1 leather fragment
1 cartridge case
5 plain ironstone sherds
19 green bottle glass
2 blue bottle glass
1 amber bottle glass
1 purple bottle glass
1 clear bottle glass
3 blue insulation glass

TOTAL ARTIFACTS FROM TEST TRENCH C = 89

Test Trench D. West of Structure 4 (Map 3) was a slight depression thought to be another structure; however, upon placing a trench into it we found undisturbed sterile soil and no artifacts.

Several other areas thought to be possible features were probed or examined with small trenches. These areas turned out not to be archaeological features.

Artifacts

The total number of artifacts recovered from the excavations at Simpson Springs was 7,347 specimens (Table 1). It is not to be inferred that all these objects were made during or date to the time of initial use of the various structures. Individual artifacts apparently varied greatly in time of deposit. There had been considerable disturbance of the floor areas and fill in the structures. Stratigraphy was almost nonexistent in terms of distinguishable layers and depth. The few inches of soil accumulation in Structures 1 and 3 had been mixed, possibly by reuse of the buildings through time. Structure 4 was the only ruin with any amount of depth, but this fill appeared to be the remains of a short-lived dump. Therefore, artifacts from different time periods were greatly mixed. The following descriptions provide the basis for dating time ranges or periods of usage of the various structures. The most abundant types of artifacts from these sites which can be used adequately for dating purposes were bottles and ceramics (Table 2). Many iron objects were discovered in the excavation process, but most of these badly rusted items proved not useful for dating purposes.

Site	Subtotal	Total	Percent
Structure 1 (inside)		1432	19
Room 1	648		
Surface	246		
East half	11		
South wall	103		
West half	43		
North wall	245		
Room 2	628		
Room 3	156		
Structure 1 (outside)		131	2
North	51		
South	50		
North wall	26		
Line of posts	4		
Structure 2		235	3
Structure 3		493	7
Structure 4		4609	63
Test Trench A		63	1
Test Trench B		295	4
Test Trench C		89	1
TOTAL		7347	100

Table 1.
Artifact Summary

PROVENIENCE OBJECT	Struc. 1	Struc. 2	Struc. 3	Struc. 4	Trenches	Totals	%
GLASS	405	95	152	2904	311	3867	52.63
Bottles & Frags.	38	90	1	2746	281	3206	43.64
Flat Glass	313	2	151	125	26	617	8.40
Other	4	3		33	4	44	0.60
CERAMICS		20	9	400	38	467	6.36
Earthenware		1		16	1	18	0.24
Stoneware		19	9	374	34	436	5.93
Procelain				10	3	13	0.18
METALS	522	53	286	717	93	1671	22.74
Cartridges	33	5	8	22	2	70	0.95
Buckles	3			3		6	0.08
Tin Cans	49	32	13	334	25	453	6.17
Cutlery				8		8	0.11
Stove Parts	9		21		3	33	0.45
Nails & Staples	145	9	239	177	16	586	7.98
Nuts & Bolts	7	2		7		16	0.22
Railroad Spikes			2	1		3	0.04
Wagon Parts	1					1	0.01
Horse Trappings	4	3	2	5	3	17	0.23
Miscellaneous	262	1	1	159	42	465	6.33
Unknown	9	1		1	2	13	0.18
WOOD	19	3	19	30	4	75	1.02
BONE	445	60	27	505	118	1155	15.72
LEATHER	31	4		53	14	102	1.39
CLOTH	10					10	0.14
TOTALS	1432	235	493	4609	578	7347	
PERCENT	19.49	3.19	6.71	62.73	7.87		100.00

TABLE 2

Summary of Artifact Types

CHAPTER 2

GLASS

Glass is transparent because structurally it is a large molecule or crystal with a liquid-like structure, or "slow-motion liquid." It is extremely useful because of its thermal conductivity at low temperatures; it can be drawn into tubing or sheets; and it has a great resistance to corrosion (Jones 1956:6-8).

Jones (1956:1) defines glass as follows:

> *a substance in the glassy or vitreous state, . . . formed by cooling from the normal liquid state, which has shown no discontinuous change (such as crystallization or separation into more than one phase) at any temperature, but has become more or less rigid through a progressive increase in its viscosity.*

He further states that

> *glass refers to a class of materials of great practical usefulness, with a number of very characteristic properties such as transparency, brittleness, and the property of softening progressively and continuously when heated.*

Glass Containers (Bottles)

A survey of several historic site reports revealed that the treatment of glass containers is almost as varied as the objects themselves. Discussion ranges from a mere mention of bottles being present (Mills 1960:40) to a section including artifact count, detailed description, comparative analysis and dating (Walker 1971:143-178). One provides a minimal description of fragments (Woolworth and Wood 1960:272), while another mentions various types of bottles according to function, without description (Smith 1960b:223-224; and Skinner 1967:110-113); and still another mixes function, description and manufacturing techniques (Miller 1960:67). Two reports by Noel Hume (1962:172-178, 190-193; and 1966:13 and 17) emphasize the dating of the bottles, with some description provided with the figures. Hudson (1961) provides data on the dating of particular types of bottles, while Treganza (1954) makes no mention of artifacts at all and refers only to architecture. The reports most valuable as references seem to be those which employ description, manufacturing techniques, and comparative analysis. There is a lack of systematized classification in historical archaeology; therefore, formal classification as described by Stone (1970) is essential.

A useful method of analyzing the hundreds of types of bottles made by hand or machine may be to examine them, both specifically and generally, with respect to physical attributes that indicate mode of manufacture. Often even the type of machine used in manufacture can be surmised from the attributes, such as the distinguishing "cut-off scars" left by the Owens Automatic Bottle machines. In some cases, the attributes of early hand-blown glass containers, such as the types the Romans made, may identify specific cultures. This method has the potential to prevent the gross overlapping of broad functional groupings.

A drawback of functional classifications is that many unlabeled or unmarked bottles are assumed to have been used for one purpose when in reality they may have been used for something quite different. A small, square bottle could have been used for shoe polish, oil, pills, dental powder, or a number of other purposes. Classifying a shoe-polish bottle several times as a pill bottle would obviously lead one to erroneous conclusions about the users.

It is not suggested that functional interpretations be eliminated; rather they may play a part in description as possible uses, and in site interpretations. The functions of many bottles with traditional shapes are well known.

Analysis of remnants of the contents left in the bottle may lead to precise identification; however, this would give the last use only, and bottles are often used for secondary purposes. Possibly the only positive method of identifying primary content is by the original label. Toulouse (1970) has demonstrated the value of labels for identifying bottles' usage.

Knittle (1948:438) divides the many varieties of bottles into eleven categories: spiritous liquors, wines, snuff, ink, shoe-blackening, unguents and perfumes, apothecary and chemical supplies, patent medicines, capers and peppersauce, pickles, and oils. Van Reusselaer (1926), Woodward (1958:126), Fontana, Greenleaf and others (1962:98-101), Freeman (1964) and Tibbitts (1966) also classify bottles according to their function. Others (Fontana 1967; Berge 1968: 179-204; and Walker 1971:143-178) describe containers in one general section--each bottle and fragment in detail, according to attributes.

Wilson (1961:2-6) has suggested a classification which takes into account the shape of base, body, shoulder, neck and neck finish. However, before this step is taken the bottles are assigned a "Class" depending on the "obvious or presumed uses" of the bottle. Fontana, Greenleaf and others (1962:101) think this system to be "an elaborate and overly-detailed method of classifying bottles." They further suggest that "bottle manufacturers used classifications of their own, but it remains yet for the archaeologist to ferret out bottle trade catalogues which show these types and to present them in newly published form." Here is a situation in which the archaeologist's "type" can be made to conform with the manufacturer's "type."

A classification system based on mode of manufacture for bottles would have to incorporate the numerous attributes of the fragments: finish types, neck types, shoulder types, body types, base types, and so on. Cross cutting these features are glass color, specific manufacturing techniques, and uses. The mineral and chemical content of the glass may also prove to be valuable for identifications.

Mode of manufacture of glass containers provides observable attributes which seem to be very useful in a classification of these artifacts. For example, the glass weight ratio to bottle volume demonstrates that there has been a trend towards using less glass through time. "For example, a fifth wine bottle in the 1930s was usually made with 22 or 23 ounces of glass, whereas they are now made with 14 to 15 ounces" (Dillon 1967).

Each glass factory followed certain patents or techniques in producing bottles. These are, for the most part, engineering decisions and therefore may be traceable to specific time periods and possibly to factories. The data herein may prove to be useful when correlated with the information provided by Newman (1970), who provides a chart for dating bottles by manufacturing techniques.

Attributes of Glass Containers

The type of bottle employed depends upon its intended purpose and the type of environment it will be exposed to. The chemical properties of the container must be taken into consideration, depending on the "internal pressure" a bottle will produce, if any, and the "thermal shock" or treatment of the vessel. Appearance is important in commercial containers also. Practically any shape or form may be used for small cosmetic bottles, because glass inherently has more than adequate strength and aesthetic qualities for such purposes (Glass Manufacturer's Federation nd:19-24).

Glass is a versatile material for packaging goods. It is inert to bacterial growth, non-permeable and non-absorbent. In the West where certain goods such as sea foods and fruits had to be shipped great distances, people could count on the contents of glass containers being edible under certain conditions.

The average bottle consists of six basic sections--finish, neck, shoulder, body, insweep or heel, and base (Figure 28). The "finish" is the top section of the bottle attached to the neck from which the bottle contents are obtained and to which a closure is applied to secure the bottle's contents from spoilage or spilling. The upper part of the finish to which a cap would seal itself is the "sealing surface." The diameter of the aperture opening is the "bore." Sometimes a ring of glass is placed around the neck at the base of the finish in order to secure the closure, usually on threaded closures, which are called a "collar." The collar, when present, is the basal portion of the finish. The "neck" is generally an extension of the finish that connects the finish to the shoulder. The neck is usually the same general size and cylindrical shape as the finish. The part of the neck that connects the neck to the shoulder is termed the "root of the neck." The "shoulder" is an extension between the neck and body which connects these sections to form the single unit. Often the body is wider than the neck, and the shoulder serves as a means of reducing the body diameter to the size of the neck and finish. The lower section of the body which attaches to the base is called an "insweep." The "base" is under the section of the bottle on which the bottle rests when not in

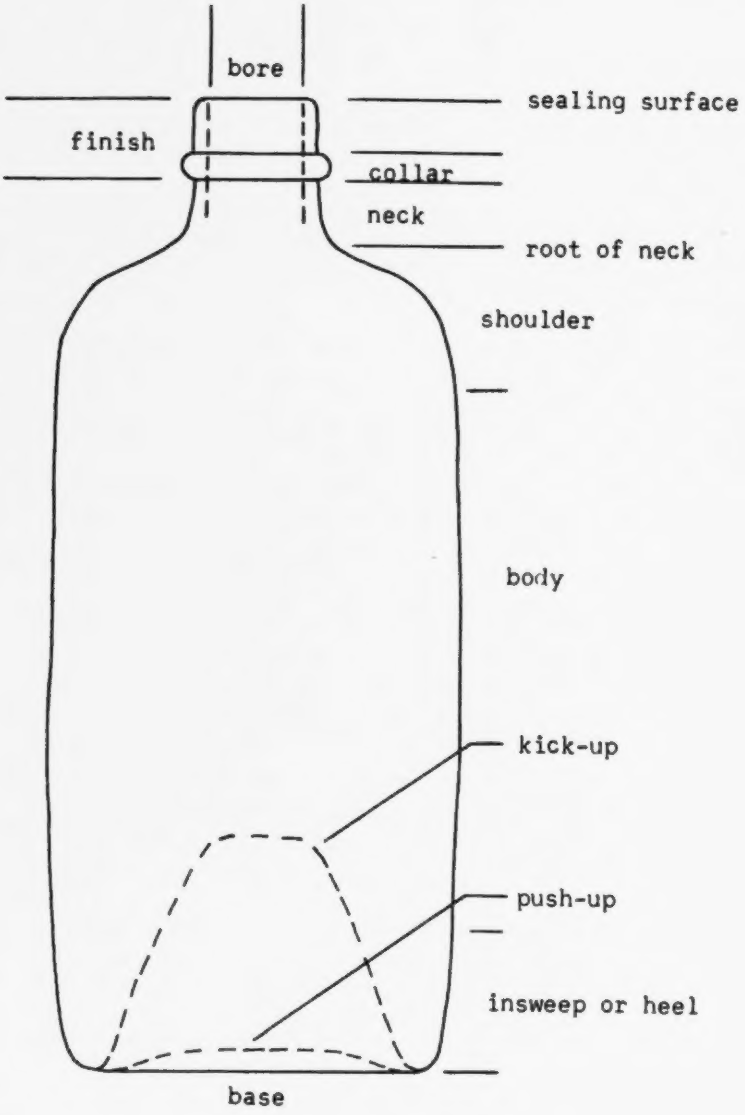

bore
sealing surface
finish
collar
neck
root of neck
shoulder
body
kick-up
push-up
insweep or heel
base

Figure 28.
Bottle nomenclature.

use. All the weight of the bottle may not rest on the entire surface of the base, if the base is not flat. Curved bases help to withstand internal pressure on the bottle, especially fermented or carbonated contents. If the base is convex, as in some soda pop bottle types, it is called a "round bottom." If the base is slightly concave, it is referred to as a "push-up" (Glass Manufacturers' Federation nd:1). On wine bottles, the push-up is much deeper and is termed a "kick-up."

Closures

The primary purpose of a closure is to keep the contents from spilling out and to protect the entrance from contaminating substances (Glass Manufacturers' Federation nd:25).

The closure most commonly used during the historic times up to the early twentieth century was the cork. In fact, it has been used from Roman times or before (Lief 1965:4). Holscher (1965:31) states:

> *While wax and resin mixtures were used in the 15th century as a stopper, the cork is also mentioned in English literature in the early 1500s for the same purpose, in connection with bottles. And it was the stopper which permitted the development of the true champagne.*
>
> *The cork was not immediately "tied-on" in the early period for, in England, at least, the wired-on cork dates from 1675-1700. In the early champagne and wine days, the corked (sealed) bottle section was inverted in a wax, compound, or oil to coat the cork; the seal was thus improved. Wax stoppers, used in Mid-Continental Europe for alchemy and medicine, were replaced by tight corks after the latter's discovery. Thus, corks became the common bottle stopper during a 300 yr. period, from early development before 1600 to almost complete use following 1900.*

There are three basic types of closures: (1) caps, (2) stoppers, and (3) seals. Much of the information in this section was obtained from Lief's (1965) excellent article on closures (quoted by permission of the publisher).

Cap types. A cap is a bottle closure that secures itself by lapping over the outside of the finish. For example, on the continuous thread (C.T.) finish the closure secures itself by screwing down by means of the glass threads on the finish exterior until it is tight; the cap is secured by some means on the exterior of the bottle finish by some modification for that specific purpose.

1. External screw--shallow continuous (Figure 29a). This type of cap closure is used on preserve jars for home canning, like the Mason jar. The lid screws down tightly by means of external glass threads on the finish. On the outside of the cap is a gasket (usually cork or rubber) that seals off air induction as it is pressed against the sealing surface of the finish. These caps are made of metal, commonly tinplate or aluminum (Glass Manufacturers' Federation nd:25).

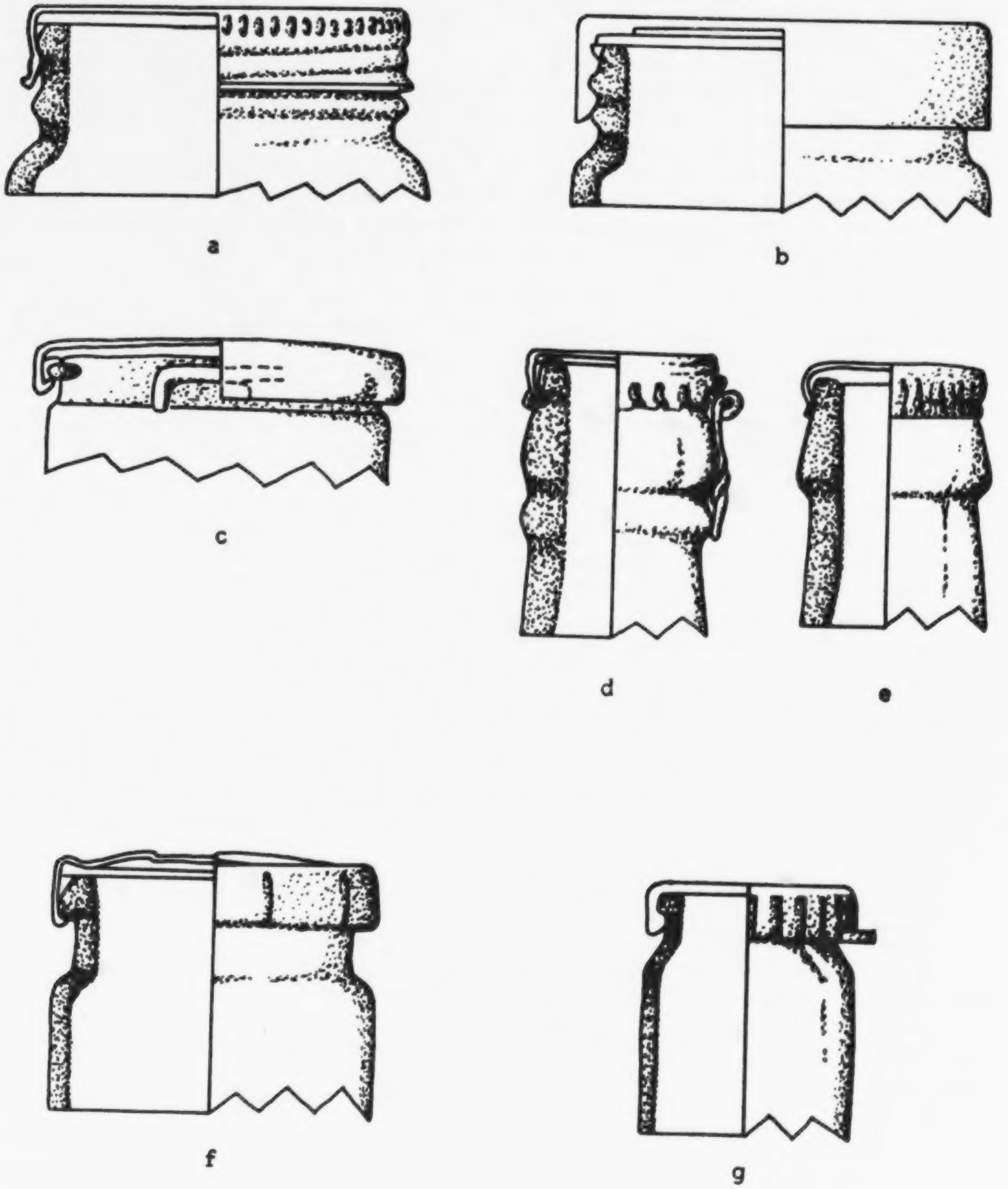


Figure 29.
Cap type closures (Glass Manufacturer's Federation nd). a, external screw (shallow continuos); b, external screw (tall continuous); c. lugs; d, lever; e, crown; f, center pressure; and, g, snap-on.

2. External screw thread--tall continuous (figure 29b). This type is almost the same as above except it has a longer screw and a wider cap depth. There are several other varieties of the screw-cap closure.

> *The Mason wide-mouth screw jar of 1858 was patented to use a lid claimed--by Mason--to be available. This patent (U.S.P. 22,186) was preceded by a patent of lids of J. K. Chase (U.S.P. 18,498) which is apparently the first U.S. patent on a screw cap for a jar (Oct. 17, 1857). Mason licensed U.S.P. 22,186 to Chase. Lids and jars were sold by several concerns and home canners were available around 1867 on which they could be used. A. G. Smalley & Co., glass manufacturers, had printed order blanks in 1882 for pints, quarts, half-gallons, porcelain caps, rubbers, and tin and glass jelly tumblers (Holscher 1965:37).*

3. Lug (Figure 29c). A variation of the screw-cap is the lug. Lugs are placed on an exterior surface of the finish which secures the cap when twisted down. Sealing pressure is obtained as the cap is tightened.

A variety of the lug cap was the Amerseal cap (Figure 34e). "Easiest of all for the consumer to remove and replace, the Amerseal cap (1906) had four inside projections that engaged lugs on the glass bead and sealed on the top. A lug finish was hard to make, and not all glassmakers liked doing it. Nevertheless, this quarter-turn cap (knurled on the sides for gripping) proved very popular with housewives and a number of companies made caps with interrupted threads to fit the Amerseal finish" (Lief 1965:22). Lief further states:

> *A radical change came in 1925 with the granting of a patent in which a cut-rubber gasket was positioned in an angled skirt that was held against the glass finish by air pressure outside the package. This cap had to be applied with vacuum inside the container . . . and the consumer could reseal a partly used package by pressing the cap back on (1965:22).*

4. Lever (Figure 29d). The principle of the lever cap is simple. The cap is placed on the sealing surface with the edge of the cap fitting over the finish and sliding into a small groove. Around the lid edge in turned-out slots is a wire attached to a wire lever, twisted to give added strength. When the lever is pressed down, the wire is pulled up tight and seals the cap securely. To open the bottle, the lever is simply lifted, loosening the wire and cap.

5. Crown (Figure 29e). The crown cap has been an extremely popular and common type of bottle closure. A plain metal cap is placed over the finish and then crimped around the groove in the finish, to seal the container.

William Painter, attempting to find a closure like the crown, invented in 1885 the Triumph, a type of lightning closure, and also the internal rubber gasket or Baltimore Loop Seal. His real objective was to find a closure that was cheap, strong and versatile, and that could be thrown away after one use. Although patented in 1892, the crown cap never really became popular until well after the depression of 1893, for money for new machinery was scarce (Lief 1965:19).

6. Center pressure cap (figure 29f). Pressure on the center of the cap expands the diameter of the cap, permitting removal. Sealing occurs when pressure on the center of the cap is released, after the cap is placed on the sealing surface. A series of lugs on the cap grips a prepared indentation in the finish.

7. Snap-on (Figure 29g). Snap-on caps today are made of plastic. This type is not air tight, but it does provide a secure seal. The cap is simply slipped over a glass head on the rim of the finish. A small tab helps one to grip the cap for removal.

8. Goldy,

> *Among the caps competing for the food trade, the Goldy (dating back to 1897) won more catsup bottles than the rest. It combined an aluminum capsule and a cork-lined tinplate disc. It opened without instruments, simply by tearing off the skirt that had been punched on the locking bead by a roller arm of the capping machine. The Goldy underwent refinements in the passing years, and spread out into larger sizes. For catsup there also came a double cap; that is, superimposed shell which covered the bottle after unsealing (Lief 1965:23).*

9. Continuous Thread (C.T.) (Figure 34c).

Screw caps began to grow in popularity after World War I, especially those of the "quick-thread" types. This led to the development of a single continuous thread in a shallow metal cap which required only a couple of quick turns to open. This cap was standardized in the industry in 1919, while the C.T. bottle finish was standardized in 1924 (Lief 1965:26-29).

> *Startling were the results. The new finish and cap, known as the C.T. (continuous thread) and benefitting by uniformity in machine bottlemaking, became popular at once. The cap benefitted too by improved lacquers and liners (other than cork or rubber) that had come along and by such touches of style as a rolled edge (instead of a raw edge) and knurls on the side, which also facilitated tightening and untightening. The C.T. cap was easy to manufacture and apply; it sealed well. A depressing ring (paragon) on the top gave it greater rigidity; while lithographed decoration lent glamour.*
>
> *The standardized C.T. cap signaled the doom of the cork and began putting the lug type, for the time being, in the shade (Lief 1965:29).*

10. Roll-on (figure 34a). In 1924, the use of aluminum provided a market for prescription bottles. An unthreaded cap was made that dropped over the neck of the bottle and was machine pressed to the shape of the individual bottle threads (Lief 1965:29).

11. Plastic. Caps molded from Bakelite, a thermosetting plastic, made their debut in 1927 in the form of toothpaste tube caps.

Two other types of caps used, but less so, were the Bernardin metal cap (Figures 34g) and the Baltimore Loop Seal (Figure 34b).

> *As bottled beer was getting under way in the 1880s, inventors like Alfred L. Bernardin of Evansville, Indiana (originally a wine importer), obtained tighter corkage by means of a tin disc held over the cork by the securing wire. The disc served also to prevent the taut wire from cutting the cork. Bernardin offered the trade discs with a scalloped edge and modules to prevent slippage. A cavity in the disc's center projected into a dent in the cork and at the same time admitted an ice-pick to bear under the wire and snap it. Discs were widely used for ginger ale as well as beer (Lief 1965:15).*

The Loop Seal

> *was pushed into a ring-shaped groove just inside the mouth and relied on internal pressure to flatten its convex underside. This was the Bottle Seal, with a facing of waxed cloth and a stud to pull it out. After a decision to replace the stud with a small iron loop, it was renamed the Baltimore Loop Seal. The loop came almost flush with the lip and could be pried up.*
>
> *The Loop Seal was probably the first single-use closure, though certaintly corks could be thrown away (Lief 1965:16-17).*

Stopper types. Stoppers are secured by some means to the interior of the finish, usually by forcing some object into the bore of the finish. Its pressure against the side of the glass serves to seal the closure. In the case of carbonated beverages, the stopper had to overcome the internal pressure.

1. Internal screw (Figure 30a). The bore of the container neck is made to accommodate threaded screws of a stopper. The closure is screwed in and becomes tight as the inside part of the closure knob tightens against the sealing surface.

2. Porcelain-top (Figure 30b). Sealing off of the bottle opening is accomplished by forcing a porcelain stopper on a rubber gasket against the sealing surface. The porcelain stopper is attached to a wire swing which, when pulled down, forces the top down by lever action, much as does the lever cap. It is released by pushing the swing up. This stopper was patented by a man named Hutter on February 7, 1893.

3. Cork (Figure 30c). The cork stopper is the most common type of closure during historic times. Corks were straight-sided or tapered; and during the nineteenth century, the top (the part that protrudes over the finish) was expanded to accommodate brand names, designs or tin plates for identification. Cork grew less and less popular with the coming of the crown cap, and it came to be

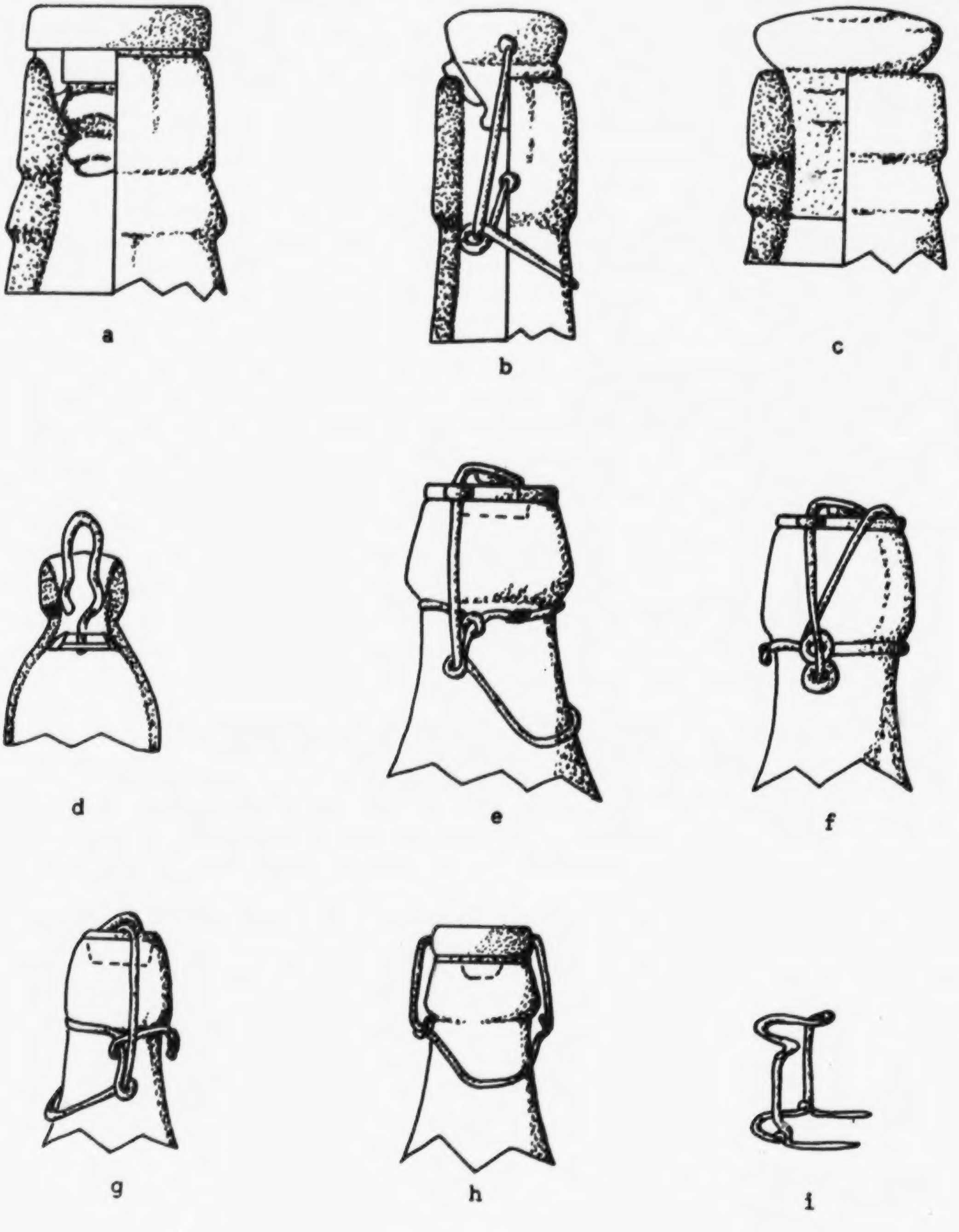


Figure 30.
Stopper type closures (Glass Manufacturer's Federation nd; Lief 1965). a, internal screw; b, porcelain-top; c, cork; d, Hutchinson Spring; e, electric; f, Pittsburgh; g, lightning; h, porcelain-special; and i, wine cork fastener.

comparatively little used after the 1920s. Traditionally, some bottles may always have cork stoppers. Champagne would not be champagne without the customary loud "pop" when the internal pressure of the wine is released. However, in time this pop may be artificially produced also.

Lief (1965:5-6) states that by 1800,

> *The market for corks had become so diversified that the product was assorted. Long "straights" answered the call for long-neck bottle stoppers; short "tapers" were cut for medicine bottles and whisky flasks. Of course, there were grades of quality, cork being a work of nature and therefore somewhat variable in texture, and the grades were identified and specified.*
>
> *What made cork so desirable was its unique cellular structure which imparted its special characteristics. Many-sided cells with thin, resinuous walls trapped air and were not interconnected. Hence, corks were compressible, impenetrable, elastic, and stable. A "straight", wider in diameter than the mouth of a bottle, could be driven into the neck; if the end extended below the neck, it sprang back to original size. This tendency to expand after compression afforded a large area of contact with a frictional grip inside the neck, making the bottle airtight, gastight, moisture proof. Here was a perfect seal.*

The utility of the cork

> *was further established by a French monk, Pierre Perignon, who in the 1660s took charge of the cellers of an abbey in the Champagne region. Perignon discovered how to blend white wine and retain its effervescence. His method of resisting built-up pressures was to use strong bottles and tied-on corks, a novelty on the European continent (Lief 4-5).*

With carbonated or effervescent products, the cork had to be more secure to prevent popping.

> *It was used, probably, with an overcoat of a material (there are several compositions) which tended to make it a better seal. Cork was adapted by the German apothecary people who had been using wax stoppers in recent generations. The only tight seal for bottles which had pressure was apparently "tow" soaked in oil. This use dates back to the concept of straw, or grass, or rushes in ancient times.*
>
> *With the adaptation of the cork we find it was soon tied on with a string and, shortly after that, wired on. We also find the wire cork screw being developed in the 17th century and going quite fancy during the 18th century. Rubber stoppers are dated as late as the 18th, or early 19th century (Holscher 1965:36).*

One end of the cork fastener (Figure 30i) was placed over the cork and the other below the finish, where the ends were twisted together to secure the cork.

> *Imitating nature, some Europeans in the late 1700s manufactured artificial seltzer water. As the art of infusing carbonic acid gas advanced, the rise of a carbonated beverage industry was foreshadowed. The first bottlers of these drinks used earthenware containers, but these proved porous. They accordingly switched to glass bottles--impervious to fluids, like the corks (Lief 1965:5).*

Possibly wine makers are the last to use the cork extensively, but after the repeal of Prohibition many cork bottles succumbed to metal screw caps. Nevertheless, corks are still used today in some wine and champagne bottles.

4. Hutchinson Spring (Figure 30d). The internal stopper dominant on soda bottles during the last of the nineteenth century was Hutchinson's Spring Stopper, patented April 8, 1879. A sharp blow in the spring loop sticking out of the bottle caused the gasket to be released. The device was a simple spring loop attached to a round gasket. The gasket pressed on the inside of the bottle and sealed itself against the interior shoulder by internal gas pressure. The pressure was released by pushing the gasket away from the glass by means of the spring loop.

5. Electric (Figure 30e). This stopper, patented October 10, 1889, was produced by the Pittsburgh Bottle Stopper Company. It is of the swing type (like the porcelain top) except for the bail. It is supposed to be positioned to close precisely as the wire is lowered.

6. Pittsburgh (Figure 30f). Another stopper made by the Pittsburgh Bottle Stopper Company was patented January 15, 1871, and added to on October 10, 1889. It also is of the swing type, except that the swing works in the opposite direction. As the swing is pulled up, the bail secures the stopper. The swing then fits over the lip of the stopper. To open, the swing is pushed down.

7. Lightning (Figure 30g). The Lightning Stopper was patented September 10, 1878. Its greatest use was on beer bottles (Lief 1965:15). It is a swing stopper like the porcelain-top type. It was on the Lightning that many other varieties were modeled. It was finally replaced by the crown cap.

8. Porcelain-special (Figure 30h). This stopper had a porcelain lid which covered the sealing surface of the finish, aiding in sealing off internal pressure. This type was generally used for large containers.

9. Glass stoppers (Figures 31 a-x and Figures 32 a-l). Many types of glass stoppers were made. Only a few are shown here. The wide stem of the glass stopper has been sand-blasted or ground to roughen the sealing surface. The inside of the finish is also roughened, and when the stopper is placed in the bottle, the two rough surfaces are sealed tightly by friction.

> *The glass stopper in today's terminology means a ground glass seal with the bottle. Loose glass-blown stoppers which fitted inside the neck of the bottle, and which were not ground, have been dated as early as 1500 B.C.--or immediately following the discovery of glass bottles. There are extensive*

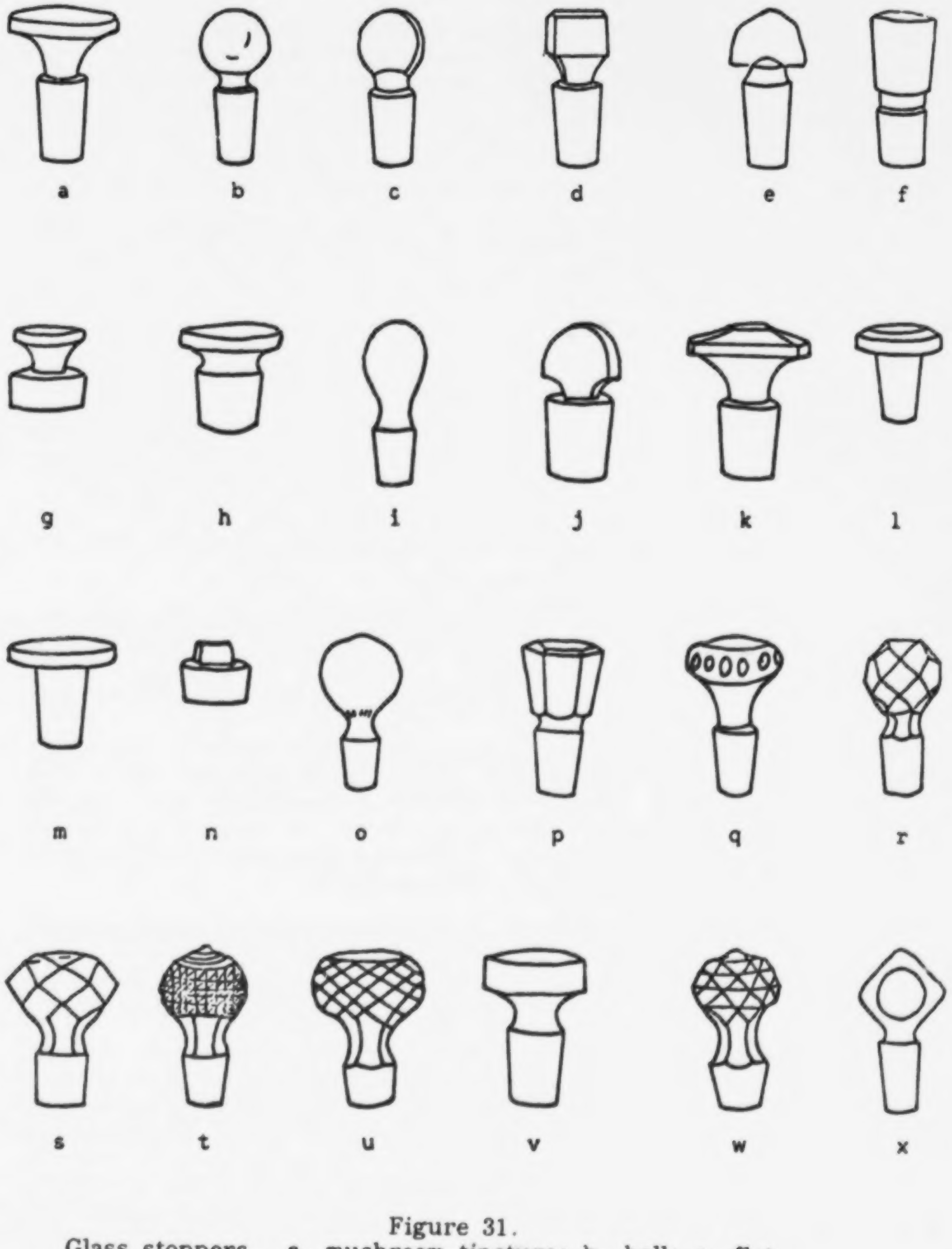


Figure 31.
Glass stoppers. a, mushroom tincture; b, ball; c, flat head or "handmade"; d, square head; e, lubin; f, tall; g, mushroom salt mouth; h, carmine; i, pear; j, medicine chest; k, table; l, club sauce; m, flat hood; n, oblong head; o, globe hollow; p, tall hexagon; q, hollow flat cut; r, lapidary; s, flat lapidary; t, diamond globe; u, extra lapidary; v, heavy top mushroom; w, full lapidary; and x, diamond head.

> *examples of tapered glass stoppers which fit loosely in the era 400-600 A.D. However, the glass stopper as we know it, in a ground condition, is a discovery of the era beginning about 1725. The development spread rapidly over France, England, and Spain, and resulted in an extensive group of stopper tip designs of highly decorative, or cut, effects. It reached America in 1790 (Holscher 1965:31).*

10. Peg Stoppers (Figures 32 m-q). Peg stoppers were made in many of the same styles as glass stoppers. Peg stoppers differ in that the stem is narrow and unroughened. It requires a wrapping of cork around the peg to produce the seal on the inside of the finish.

11. Carboy stoppers (Figures 32 r-t). Clay discs were used to cover the aperture of carboy bottles. These stoppers were probably secured with wire.

Vacuum Seal Types. Seal closures are made secure and airtight by the contraction of cooling within the bottle which creates a vacuum. Vacuum seals are generally used on wide-mouth food jars. These types of closures are relatively recent, and in 1925 only about 40 percent of packaged food stuffs were vacuum sealed (Lief 1965:31).

1. Phoenix (Figure 33a). The Phoenix cap was invented in Paris by Achille Weissenthanner in 1892 (Lief 1965:20). It is a two-piece cap consisting of a tin plate and rubber ring that is held in position by a safety band (Figure 34h). The band is secured by a tongue-and-eye compressing apparatus. The band was crimped on top and bottom which secured it around the circular disc and to a glass bead finish (Figure 34k). The Phoenix cap was first measured in millimeters (48 mm, 53 mm, 58 mm, 63 mm, and so on). This led to adaptation of a similar numbering system in the United States. The Phoenix-type jar was used for jams, jellies, preserves and other products which could be stored due to high sugar content (Lief 1965:21).

2. Sure Seal (Figure 33b). In 1908, a tighter seal was accomplished by the Sure Seal cap. The lower skirt edge of the cap was crimped under a glass edge (Figure 34f). The only problem with the Sure Seal was that it buckled upon being pried off and could not be resealed (Lief 1965:22).

3. Giles (Figure 33c). At the turn of the twentieth century, more and better ways of sealing food items were being researched, invented, and patented. One such patent of 1902-03 was the Giles jar and cap (Figure 34l). Mainly used for cold-pack vacuum processing of meats, it consisted of a horizontal ledge just below the top of the finish to which a rubber gasket was vacuum sealed against the straight wall (Lief 1965:22).

4. Spring seal (Figure 33d). This seal is similar to the Sure Seal except that the skirt is not crimped. A spring instead is used to hold pressure on the lid.

5. Disc seal (Figure 33e). Today the most popular type of home bottling seal closure is the type in which a loose disc is incorporated in

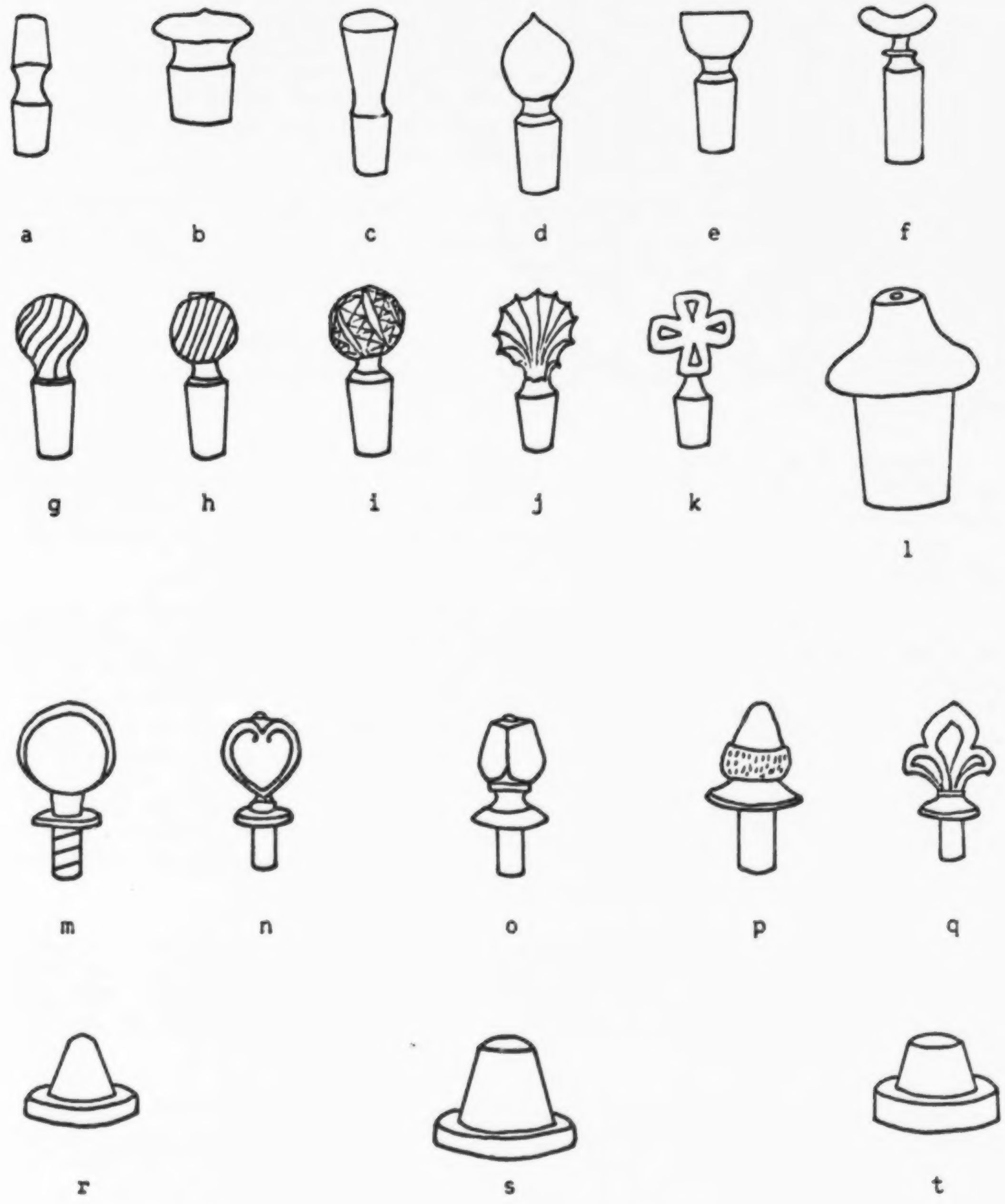


Figure 32.
Glass, peg and carboy stoppers. Glass stoppers: a, cone; b, teat carmine; c, German; d, teat ball; e, half ball; f, crescent; g, cable; h, ribbed; i, band; j, shell; k, cross; and, l, squirt top (barber's bottle). Peg stoppers, m-q, and carboy stoppers, r-t (clay).

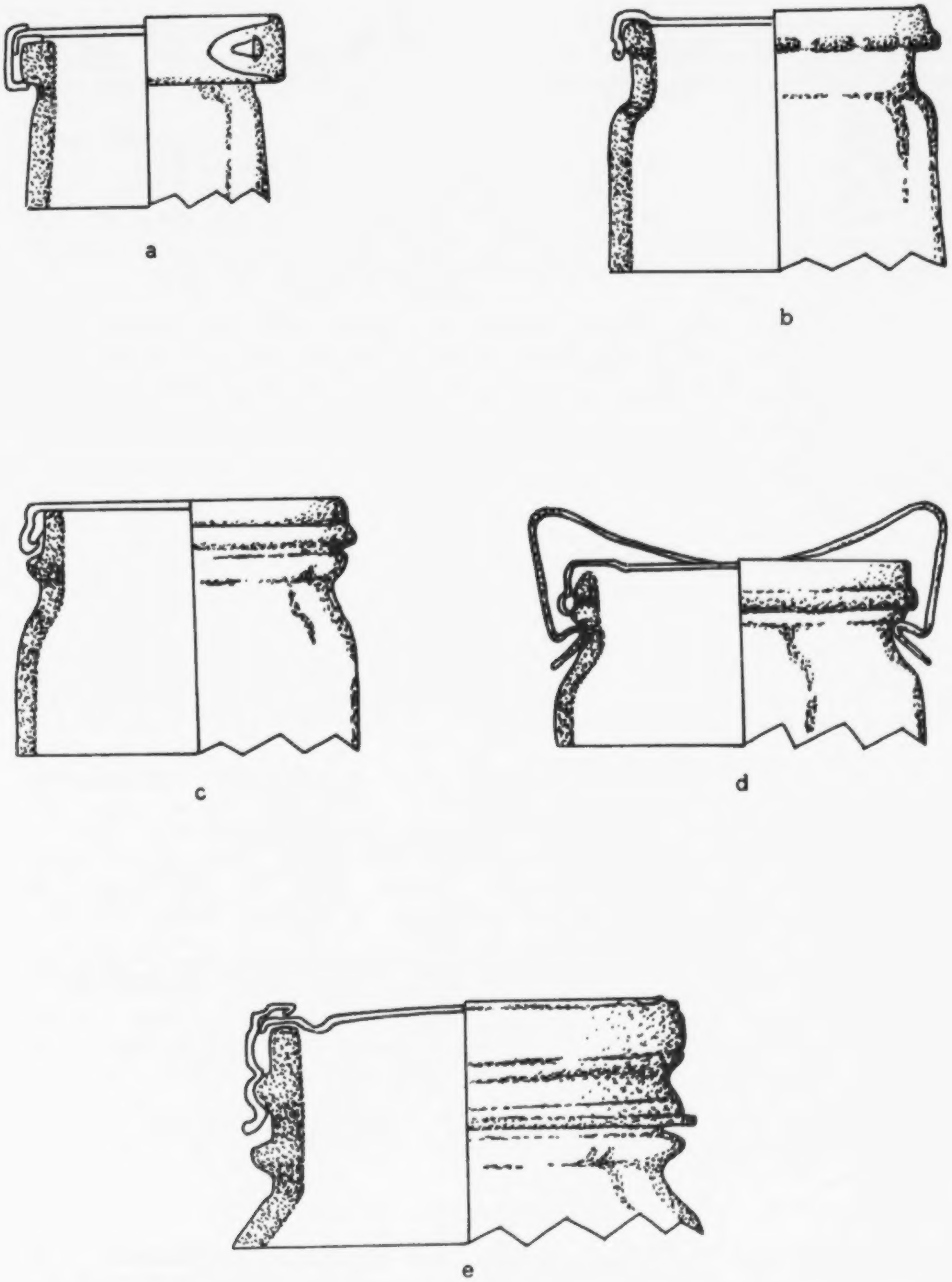


Figure 33.
Seal type closures (Glass Manufacturers' Federation nd: 25). a, Phoenix (safety band); b, Sure Seal (crimped); c, Giles (rubber ring); d, Spring; and e. disc.

a screw-ring. This type of closure had its beginnings with Nicholas Appert's sealed cooking process (1810) and John L. Mason's fruit jar (1858).

The first discs used fitted into a zinc seal. Invented by Lewis R. Boyd, they were made of opal glass, also called porcelain. The glass disc prevented metal from touching the contents, but removing the seal closure was a problem. The early Boyd seals had a small handle attached to aid the housewife in removing the lid.

Shortly after 1873, Mason became associated with the Consolidated Fruit Jar Company, which produced Mason jars; but by 1888 many other companies were making the jar (Glass Containers Manufacturers' Institute nd:7-8). Some were Whitall Tatum Company (marked WHITALL'S PATENT, JUNE 18th, 1861); Clyde Glass Works (1864-1915); A. G. Smalley & Co. (Patented September 23, 1884, but marked MASON'S PATENT NOVEMBER 30th, 1858, or MASON'S IMPROVED); Ball Brothers (first fruit jars in 1885); C. J. Root (1901-1908); Latchford Glass Company (1925-1938, green glass prior to 1930); Hero Fruit Jar Company (marked with a Maltese cross and HERO); Consolidated Fruit Jar Company (monogram CFJC, made by the Clyde factory); and Kerr (also made an indigo blue jar between 1910-1930, besides modern type). Some of the trade names used on Ball Brothers jars are Standard (discontinued 1912), Perfect (from 1915), Quick Seal, Safe Seal, Drey, Banner, and Climax (Ellsberg nd:3). Toulouse (1969) describes many additional varieties of fruit jars.

During the 1930s and after, many types of packaging conveniences were added to the regular closures. One of these was the "tamperproof" closure. A common type still used today is the "clicking dome" used on baby food containers. If the coined dome center does not click when opened, the mother knows that the jar has been tampered with previously and the food may be spoiled (Lief 1965:35).

A popular variety of relatively modern closures are fitments. Common types include sifters (Figure 34i), sprayers (Figure 34m), dispensers (Figure 34n), applicators, spouts, pour-outs, plugs, droppers (Figure 34j) and shafts. Fitments made mostly of polyethylene provide a secondary function to this type of closure (Lief 1965:43).

The marks of some of the companies that produce modern types of closures are illustrated in Figure 35.

Finishes

The finish and closure are interrelated entities of any bottle. The closure must conform to the finish in order to accomplish its purpose and vice versa. The development of finishes follows that of closures. The invention of closures corresponds to certain finishes. A closure may be adapted to old finishes already in use, or finishes and closures may be invented together so that they correspond to one another.

The finish not only serves to protect the contents by use of a closure, but it further serves to let one get to the contents.

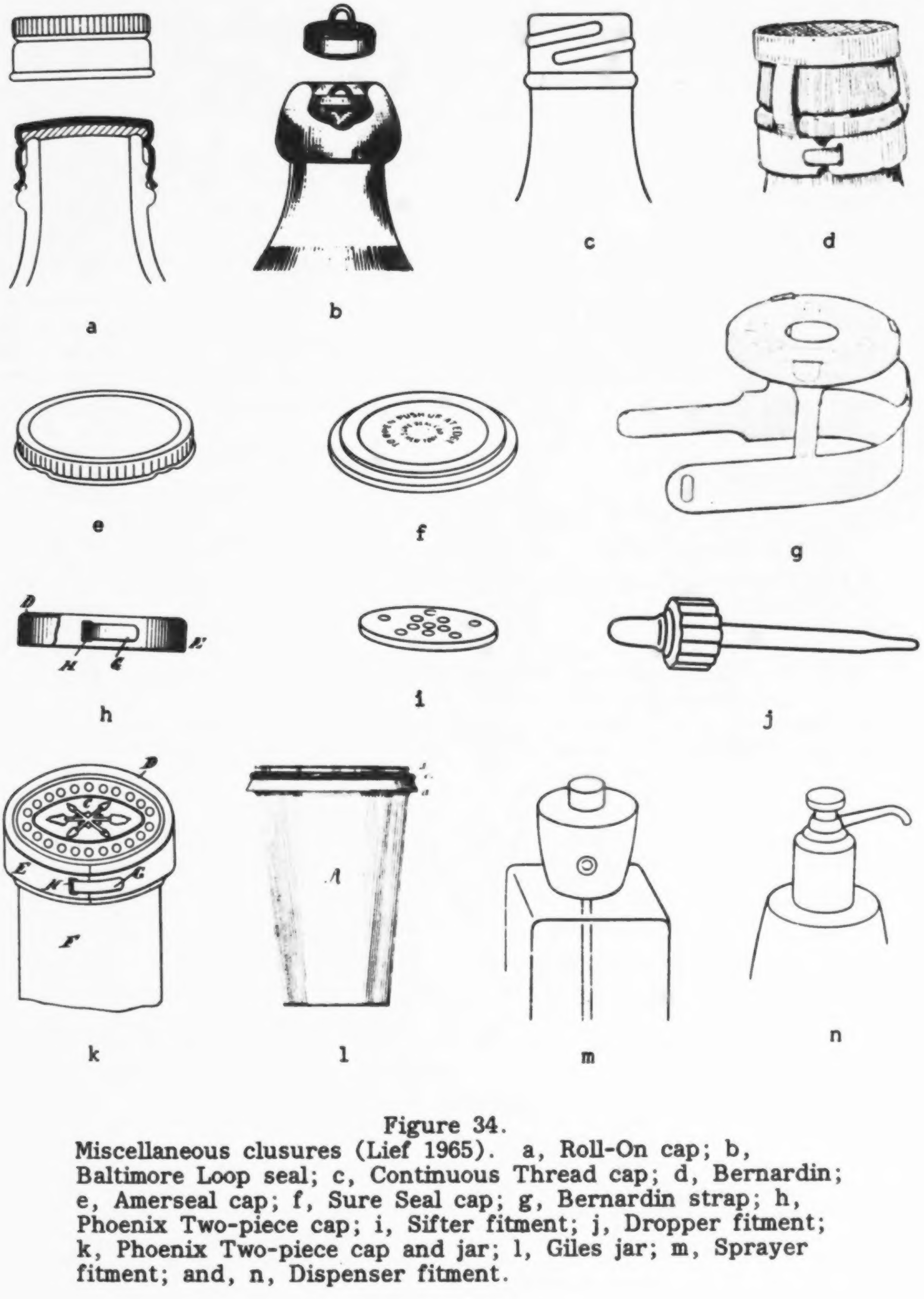
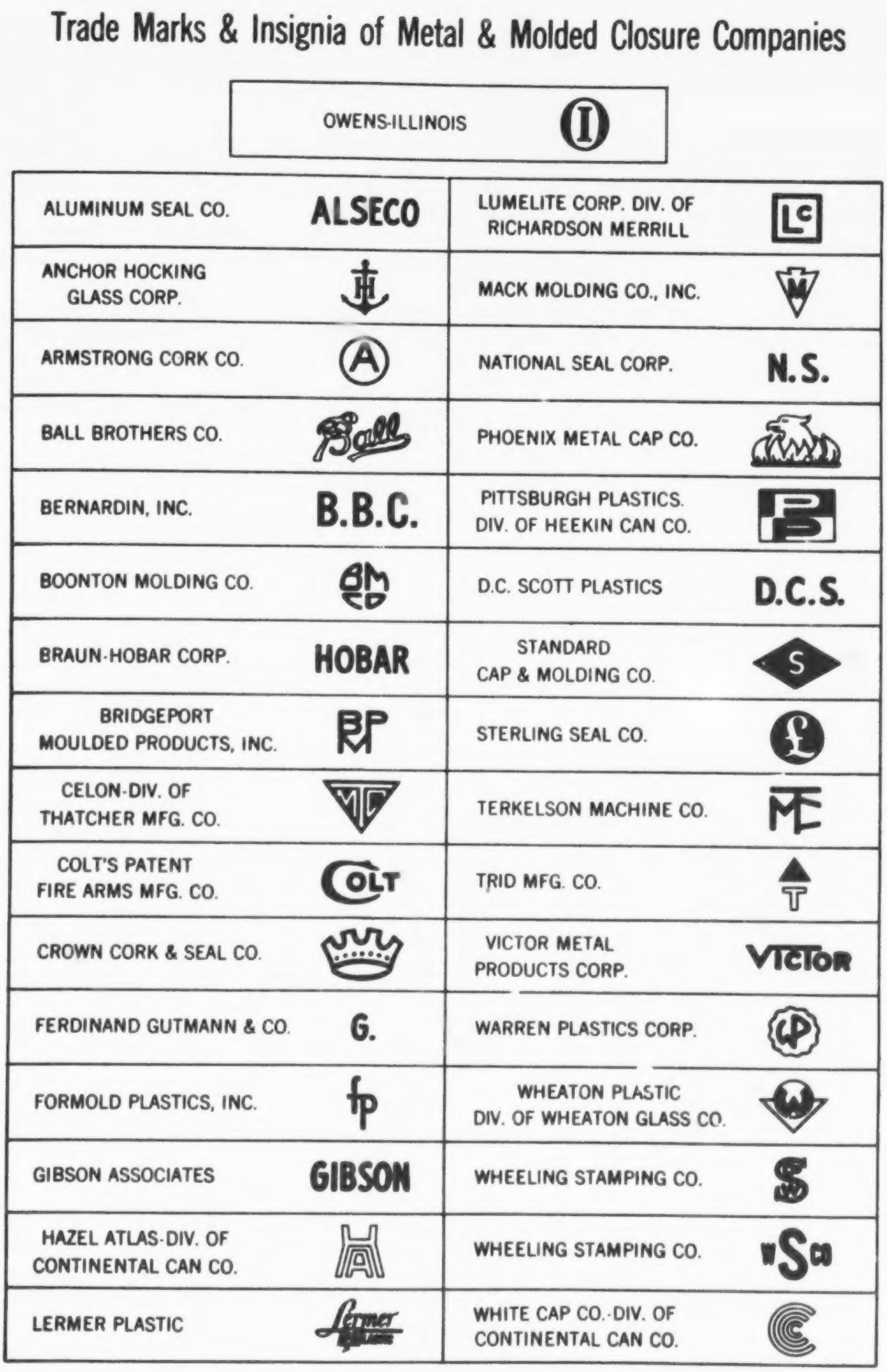


Figure 34.
Miscellaneous clusures (Lief 1965). a, Roll-On cap; b, Baltimore Loop seal; c, Continuous Thread cap; d, Bernardin; e, Amerseal cap; f, Sure Seal cap; g, Bernardin strap; h, Phoenix Two-piece cap; i, Sifter fitment; j, Dropper fitment; k, Phoenix Two-piece cap and jar; l, Giles jar; m, Sprayer fitment; and, n, Dispenser fitment.



Trade Marks & Insignia of Metal & Molded Closure Companies

OWENS-ILLINOIS I

ALUMINUM SEAL CO.	ALSECO	LUMELITE CORP. DIV. OF RICHARDSON MERRILL	LC
ANCHOR HOCKING GLASS CORP.	H	MACK MOLDING CO., INC.	M
ARMSTRONG CORK CO.	A	NATIONAL SEAL CORP.	N.S.
BALL BROTHERS CO.	Ball	PHOENIX METAL CAP CO.	
BERNARDIN, INC.	B.B.C.	PITTSBURGH PLASTICS. DIV. OF HEEKIN CAN CO.	PP
BOONTON MOLDING CO.	BMCO	D.C. SCOTT PLASTICS	D.C.S.
BRAUN-HOBAR CORP.	HOBAR	STANDARD CAP & MOLDING CO.	S
BRIDGEPORT MOULDED PRODUCTS, INC.	BPM	STERLING SEAL CO.	£
CELON-DIV. OF THATCHER MFG. CO.	MTC	TERKELSON MACHINE CO.	TMC
COLT'S PATENT FIRE ARMS MFG. CO.	COLT	TRID MFG. CO.	T
CROWN CORK & SEAL CO.		VICTOR METAL PRODUCTS CORP.	VICTOR
FERDINAND GUTMANN & CO.	G.	WARREN PLASTICS CORP.	WP
FORMOLD PLASTICS, INC.	fp	WHEATON PLASTIC DIV. OF WHEATON GLASS CO.	W
GIBSON ASSOCIATES	GIBSON	WHEELING STAMPING CO.	S
HAZEL ATLAS-DIV. OF CONTINENTAL CAN CO.	HA	WHEELING STAMPING CO.	WSCO
LERMER PLASTIC	Lermer	WHITE CAP CO.-DIV. OF CONTINENTAL CAN CO.	C

Figure 35.
Company trademarks of modern closures (Owens-Illinois 1964).

Adaptation can be made to the finish, to facilitate pouring. In other cases, the finish may have to be widemouthed, to allow food to pass through it. In the latter case, the closure would have to be adapted to the desired size of the aperture.

Real progress in the standardization of finish types occurred in the 1920s and '30s, along with that of closures. Although the bottle machines made identical finishes, these were not standard except in any one factory. Standardization meant exacting specifications that influenced the whole glass industry.

There are numerous types of finishes, and any attempt to describe all of them would require the study of a vast collection of samples. The types include herein are those commonly found in bottle collections. These types are more or less standard, but many bottle users prefer their own personal design. There are slight modifications of these types, but varieties are not considered. This basic classification of finishes is from Berge (1968:195 and Figure 15).

1. Prescription (Figure 36a). On all prescription finishes the sealing surface tapers into the bore. The bore itself is slightly tapered at times, to permit sealing with a tapered cork. As the name implies, these finishes were used on medicine bottles, usually graduated, for the dispensing of prescription drugs. Apothecaries themselves bought bottles, either plain or embossed with the firm's name, and filled them with drugs. The flaring mouth of the prescription finish facilitates pouring exact quantities of the medicine, even counting drops.

2. Wide prescription (Figure 36b). A slight variation of the above prescription finish is the wide prescription. The finish has an extra broad, thin lip. This type was used on reagent bottles (like acid containers).

3. Patent Lip (P.L.) (Figure 36c). In the period of extensive bottle production in the late nineteenth century, the Patent Lip outnumbered any others made. It was the most common type used on patent medicine bottles. It has also been referred to as an "extract lip."

4. Packer (Figure 36d). Also called a "deep lip" or "deep packer," the packer finish is like the patent finish except that it is wider along the lip edge. This type is found on varieties of English Essential Oils.

5. Trumpet-mouth (Figure 36e). This type has a simple outflaring of the neck. It was used on cologne bottles with glass stoppers.

6. Extract (Figure 36f). This finish has round lip edges, but the sealing surface has been flattened. As the name implies, it was used on many extract bottles.

7. Reinforced extract (Figure 36g). It is the same as the extract finish at the lip, but the neck below the lip has been widened to give added strength.

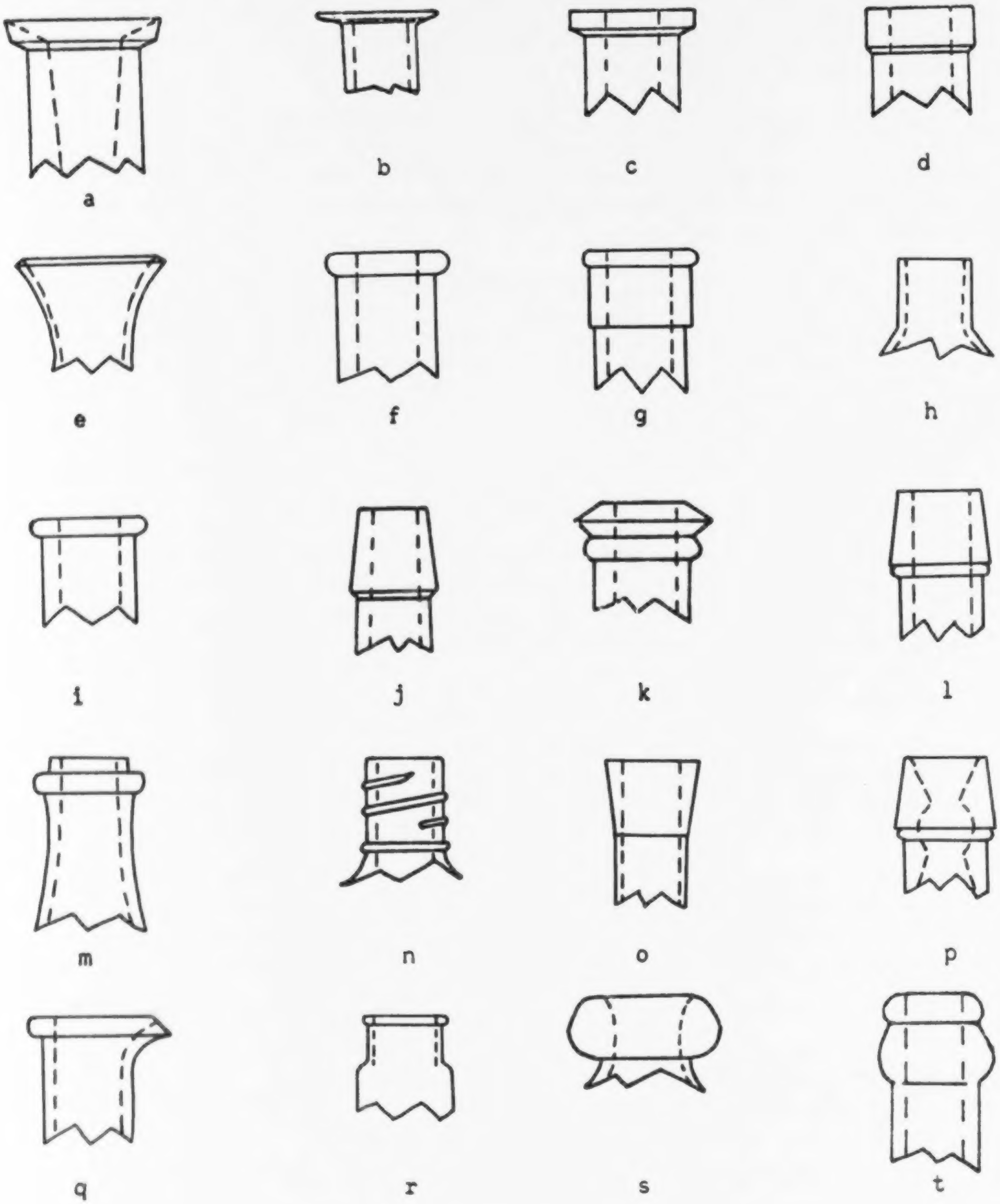


Figure 36.
Bottle finishes. a, prescription; b, wide prescription; c, patent lip (P.L.); d, packer; e, trumpet-mouth; f, extract; g, reinforced extract; h, blow-over; i, bead; j, oil (ring); k, double ring; l, brandy; m, champagne; n, continuous thread (C.T.); o, flare; p, internal thread; q, spout; r, vial; s, soda; and t, crown.

8. Blow-over (Figure 36h). This type was very common on early historical flasks. Actually, there is no finish to the neck except that the end of the neck is ground smooth, sometimes slightly outflared. This type was also found on small ink bottles and some types of vials.

9. Bead (Figure 36i). A bead of glass is melted onto the rough edge of the neck around the bore. It is similar to the extract finish, but has not been ground flat. Bead finishes were found on pickle, olive and other such vessels.

10. Oil (Figure 36j). Oil, and "ring," finishes are very common on castor oil, liquor and beer bottles. The liquor and beer versions are larger than those found on castor oil containers. This type was also found on olive oils and some soda pop bottles.

11. Double-ring (Figure 36k). The upper ring is not generally as sharp as it appears in the idealized form. Rather it is round like the second ring, or is like that on most picnic flasks. The more pointed varieties were used on Citrate of Magnesia bottles.

12. Brandy (Figure 36l). The brandy finish consists of an oil finish with a collar. It has also been called a "wine finish." It was frequently used on pint-size oval liquor flasks as well as on the larger sizes.

13. Champagne (Figure 36m). Commonly found on champagne bottles, this finish differs from that on wine bottles in that the sealing surface is slightly tapered upward toward the bore. The common "wine finish" does not have this taper. It is instead flat, though the ring around the neck is yet below the aperture.

14. Continuous thread (C.T.) (Figure 36n). Although popular from 1924 to more recent times, this finish is extremely important, since it generally caused the replacement of practically all the previously existing types of finishes. Because this type requires a screw cap, it is unlike the previously mentioned stopper finishes.

15. Flare (Figure 36o). This is not merely a flaring blow-over finish, but actually a flared extension that has been secured to the neck.

16. Internal-thread (Figure 36p). The inside glass of the finish and neck has been altered in such a way as to reduce the neck opening in one area. This opening is for the use of a screw closure.

17. Spout (Figure 36q). To facilitate pouring from a bottle, the lip flange has been troughed and slightly extended to reduce drippage or to prevent liquid from running down the bottle. This type is found on ink bottles of the longer variety.

18. Soda (Figure 36s). The blob-looking soda pop finish is usually found in association with Hutchinson's Spring Stoppers or similar ones. This type is distinctive in that the large blob of glass forming the finish on top stands out.

19. Vial (Figure 36r). This finish looks like a miniature patent finish, but is common only to types of small vial bottles.

20. Crown (Figure 36t). The crown cap brought to a close the use of cork stoppers for many purposes. The crown finish, made specifically for the crown cap, therefore did not really become popular until the turn of the century.

Neck Types

Practically all necks have a basic cylindrical shape. Modifications of the cylindrical neck produce the basic types.

Bottle necks can be short or long depending on the relationship to the length of the body. Good proportions for defining neck length could be as follows:

(1) Short neck: the neck and finish are equal to less than one-fourth of the length of the body.

(2) Regular neck: the neck and finish are equal to one-fourth, but less than one-half of the body length.

(3) Long neck: the neck and finish are equal to one-half or more of the body length.

The "body length" here means from the base to the top of the shoulder. A bottle may have no neck at all, or at least a very slight one.

Necks can be described as cylindrical, round, tapered, square, etc. Some common types are:

Bulb neck (Figure 37a). Bulb necks are common on beer bottles but are also found on liquor and other bottles. Bulb necks expand out from the shoulder and then in toward the finish, like a uniform bulge around the cylindrical neck.

Ball neck (Figure 37b). This type of neck is very common to paneled bottles. An extra ring around the cylindrical neck is its only feature. When there are two such rings it could be called a "double-ball neck."

Swirled neck (Figure 37c). The distinguishing features of necks of this type are the vertical swirl marks that make the neck appear to have been twisted when still in a plastic state. The swirl neck is found on fancy liquor bottles.

Choke neck (Figure 37d). In bottles with choke-type necks, the bore of the neck tapers from the aperture to a small opening in the middle of the neck. When the maximum restriction is reached, the inside neck opening widens out to the shoulder and body. This type of restriction is used for controlling or reducing the flow of fluid from the bottle. Bottles used at bars where control of pouring exact amounts into jiggers is required are of this type.

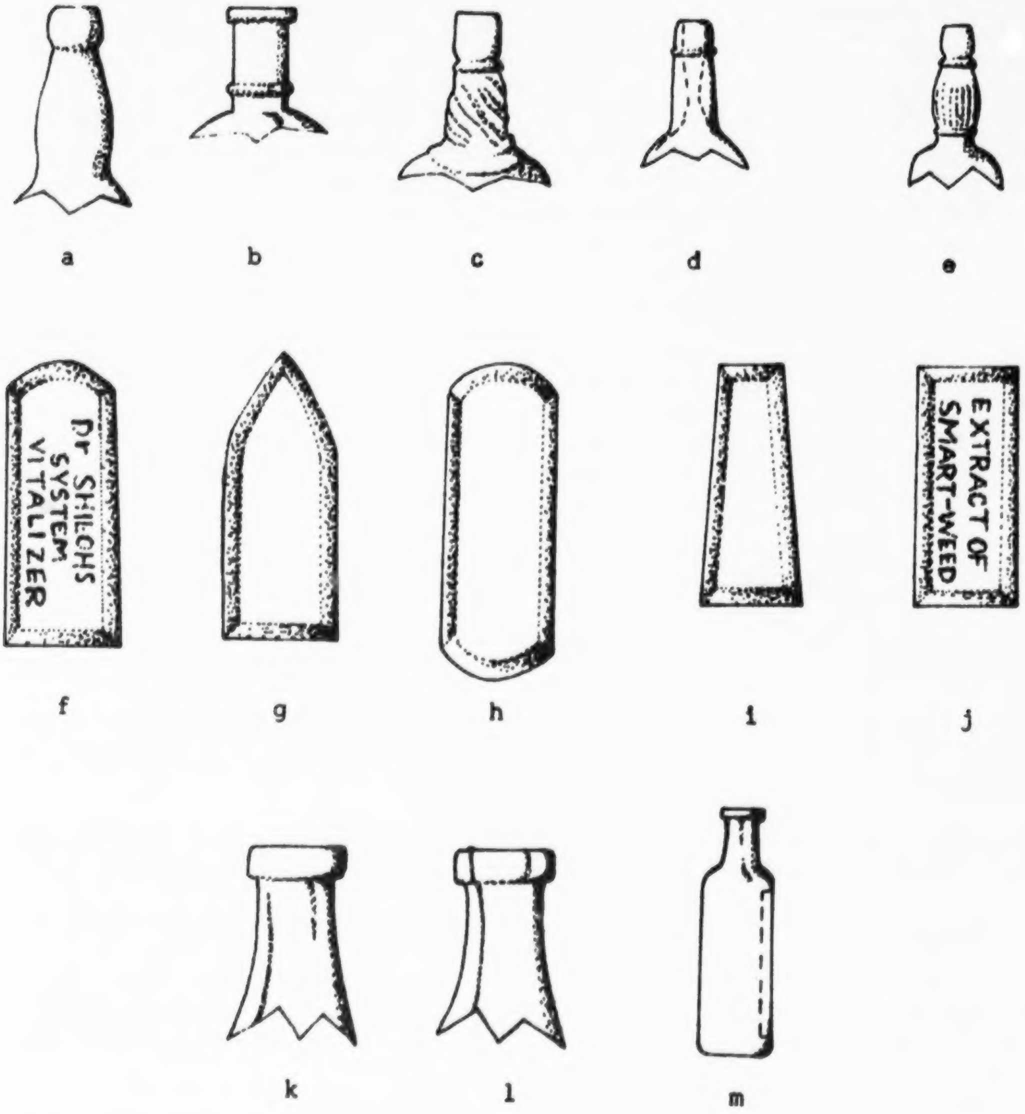

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Figure 37.
Neck types, body types and bottle features. Neck types: a, bulb; b, ball; c, swirled; d, choke; and, e, ribbed. Panelled body types: f, arrow; g, gothic; h, mammoth, i, tapered; and, j, rectangular. Features: k, mold seam; l, machine seam; m, indented panel.

Ribbed neck (Figure 37e). Necks of this type are similar to the swirl except that the neck has not been twisted. The grooves are therefore perpendicular to the collar.

Body Types

The main body of the bottle comes in many shapes. The body having length, width and depth, is three dimensional, making one-term descriptions difficult. A useful way of describing bottle bodies would be a two-term system. The first term would describe the shape of the body length and the second the breadth and the width shape. For example, a body described as "tapered-oval" would mean that the bottle tapered from the base to the shoulder and was oval in shape at a horizontal cross section halfway up the body. A taper in the opposite direction would be termed a "keystone."

Some of the shape terms to consider are cylindrical, round, square, rectangular, oval, tapered, fluted, hexagonal, octagonal, pear, and keystone.

A more specific body type is the paneled body. Panels are flat indentations into the body formed during molding (Figure 37m). A bottle body may have one panel (1-sided panel), two panels (2-sided panel), three panels (3-sided panel), or four panels (4-sided panel). Some types of panels are:

Arrow panel (Figure 37f). This panel is rectangular except that the top is curved like an arc. The long direction of the rectangle is perpendicular to the base, as are most panels.

Gothic panel (Figure 37g). The top of this panel tapers to a point near the shoulder of the bottle, forming a gothic arch.

Mammoth panel (Figure 37h). Both the top and bottom ends of this panel are a rounded arch.

Tapered panel (Figure 37i). The long section of the panel tapers from the upper section to the lower section. A taper in the opposite direction would be a "keystone panel."

Rectangular panel (Figure 37j). This type and the oval panel are self-explanatory.

Patent medicine bottles were usually embossed on the panel surface--a description of the contents and maker. In more recent times, various types of attachable labels were placed in the panels.

The body of the bottle is the main area for indicating the contents of the bottle. This has been accomplished by a variety of different methods: labels, embossing, sand blasting, etching, painting, and others. In more recent times, a variety of new techniques have been invented to make the lettering stay fast to the bottle even if it were to be reused (multi-trip bottles) and needed to be sterilized.

Base Types

The base of the bottle usually conforms to the shape of the bottle on the horizontal plane. The base, like the other parts of a bottle, has to be designed to prevent spillage or being knocked over easily. Like the body, the base can be round, square, oval, rectangular, and so forth. A base slightly concave is called a push-up, while wine and champagne bottle bases that are very deeply concave are termed kick-ups. The base may also be paneled (Figure 28a), bordered (Figures 38 b-n), indented (Figures 38 o-p), flat (Figures 38 q-y), or otherwise formed.

Mold Seams and Accessories

Changes that took place to the growing bottle industry during the nineteenth century resulted in many subtle characteristics found on the container. By 1800 the most widely used method of making bottles and other glassware was by blowing; glass produced by this method is termed hand-blown, free-blown, or off-hand-blown (Lorrain 1968:35).

Lorrain (1968:35) states:

> *Surfaces of hand-blown pieces are smooth and shiny and are without impressed designs or letters. Design may be art, engraved, or etched into off-hand-blown pieces after they are cooled but these are not an intrinsic part of the glass. Decorative globs or threads of molten glass may be added to the object before it is cooled but they will also have smooth, shiny surfaces.*

Other characteristics of this technique of glass manufacture are the presence of a pontil mark, asymmetry and lack of mold marks.

Munsey (1970:38-50) provides specific details for recognizing techniques used by manufacturers as various molds changed through time. His methods of identifying the molds used on specific bottles and the time range in which these technological techniques were in operation are outlined below:

I. Non-Shoulder Molds--This type of mold forms the body only and may or may not have mold seams at the shoulder.

A. Dip Mold (Figure 39a). The body and base are formed in this one-piece mold. The bottom is slightly smaller than the shoulder, where there may be a mold seam. This type of mold produces a uniform body shape up to the shoulder, and the finish may be handmade.

B. Pattern mold (second half 1700s and 1800s). Early pattern molds have perpendicular ridges or grooves, and there may be an irregularity in the glass at the shoulder, or a wrinkle at the neck.

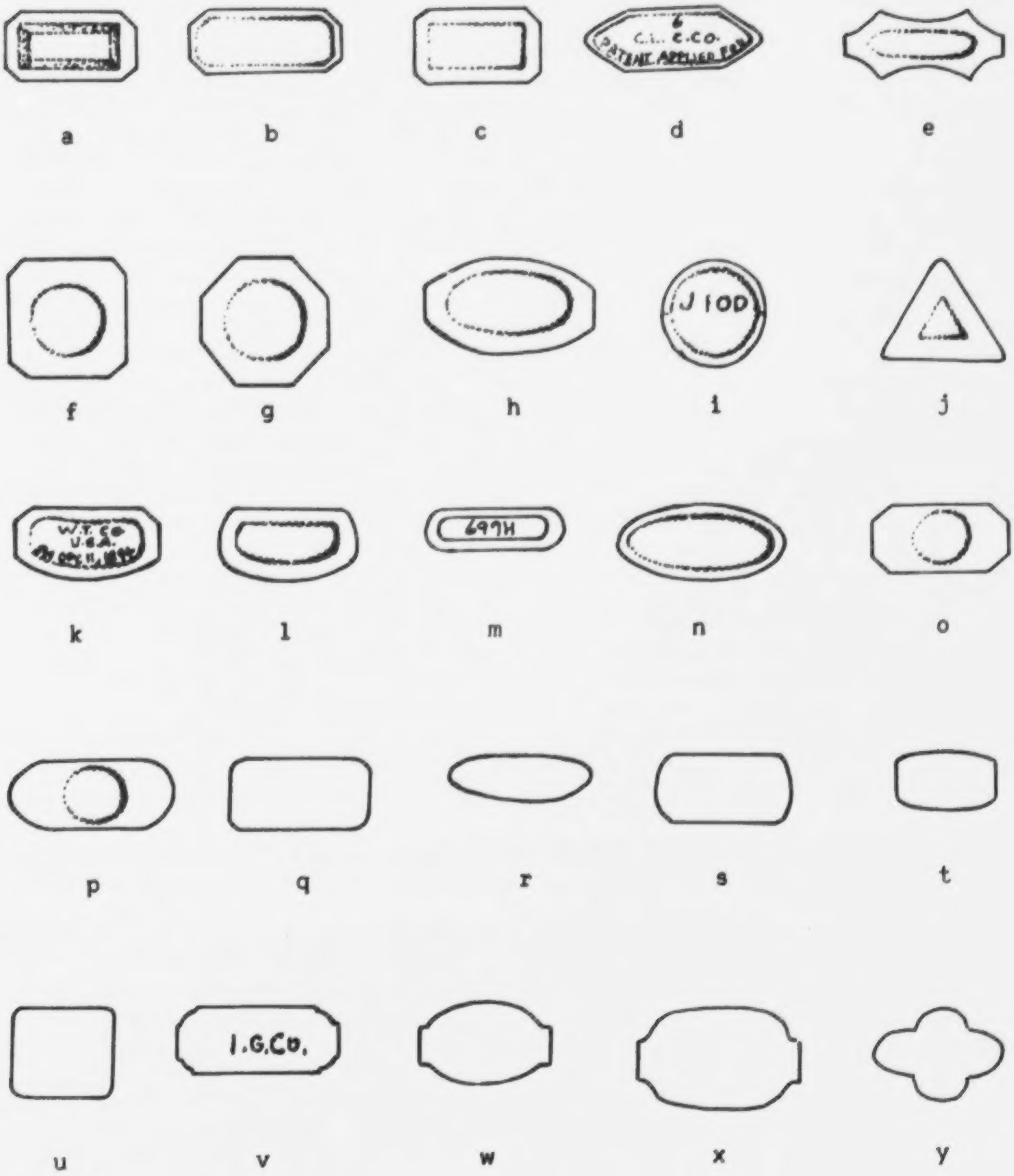
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Figure 38.
Base types. a, panel type; b-n, border type (c, blake; e, flared; f, French square; and, l, Philadelphia oval); o-p, indented type; q-y, flat type (q, ideal oval; r, plain oval; s, elixir; t, western oval; u, Hopkins square; v, oblong prescription; w, union oval; and, x, Baltimore oval) (Putnam 1965).

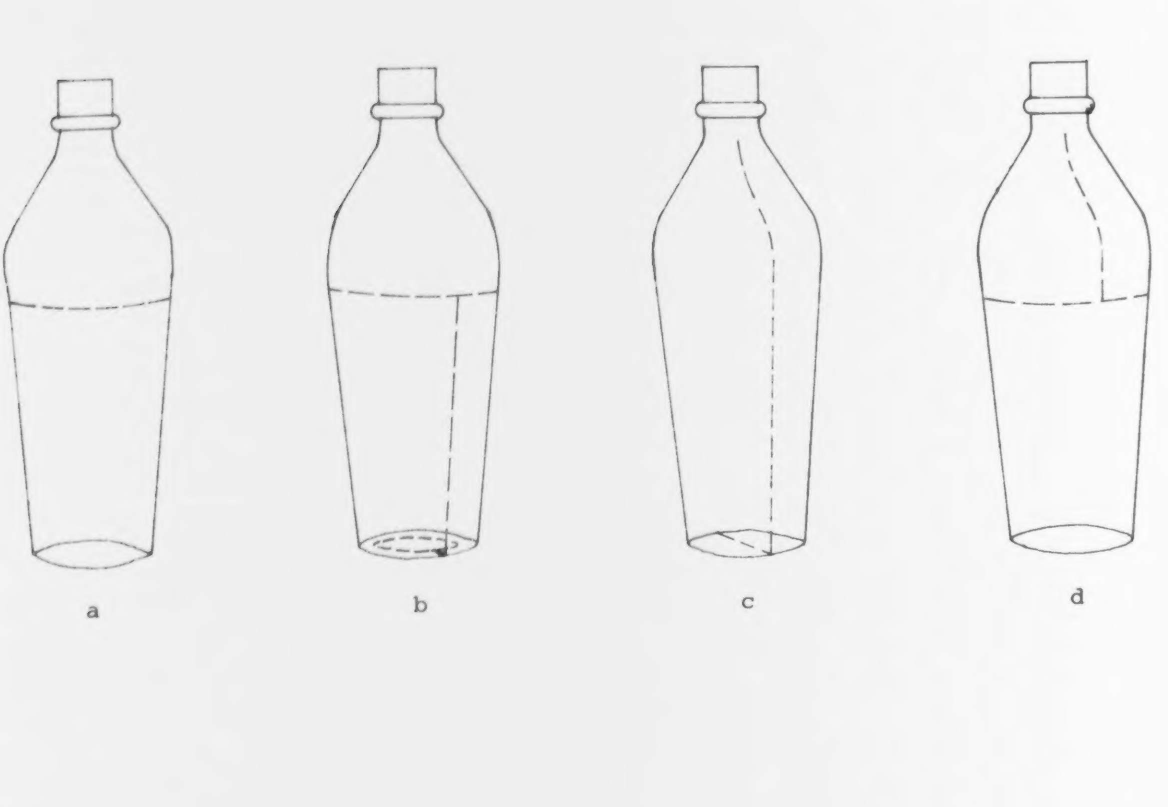

Figure 39.
Types of bottle mold seams
(After Munsey 1970).

C. Hinged shoulder-height mold (late 1700s and 1800s) (Figure 39b). This type of mold does not have to be tapered, since the mold apparatus opens at the shoulder. The side seams disappear at the shoulder and the body could be embossed.

II. Full-height Molds

A. Bottom-hinged mold (c. 1810 - c. 1880) (Figure 39c). The mold seams on bottles manufactured by this method have seams up the sides and across the base. The seams across the bottom come in two varieties: (1) straight across the bottom; and (2) curves around a slight push-up in the center. The bottom seams may be obliterated to some degree by a pontil scar, except when a snap-case was used, in which case the mold seam would be intact.

B. Three-part mold with dip mold body (1870-1910) (Figure 39d). This mold produces seams around the shoulder and up to the finish area. It allows versatility in designing the shoulder, such as embossing which, however, was not usually done. It did not provide for embossing on the lower half of the bottle.

C. Three-part leaf mold (handblown period of the 19th century) (Figure 39e). This type of mold produces three mold seams equally spaced up the sides of the bottle.

D. Post-bottom mold (Figure 39f). From this type of mold, seams are produced down the sides and to a circle around the bottom.

E. Cup-bottom mold (Figure 39g). The seams from this type of mold run down the sides to the heel and around the outside of the base.

F. Blow-back mold (mid-1800s). This type of mold leaves a rough and ragged edge around the top of the finish. This rough area is ground down so that closure can seal on the sealing surface. This mold was used in early fruit jars, on which screw threads were molded with the rest of the bottle in one piece.

G. Automatic Bottle machine (1904 on). The advent of the automatic bottle machine produced bottles with new mold seams. These molds produce seams up over or around the top of the sealing surface (Figure 39h). However, beverage bottles are fire polished to eliminate the seams so they will not cut the mouth of the drinker of the contents.

In addition to the above molds and others, there were processes, accessories or tools that produced distinguishing features on bottles. One such process produced in a full-height mold is called a turn-mold bottle, used between 1880 and 1910. In this process mold seams are obscured by turning the bottle in the mold. Bottles treated this way are highly polished, cannot be embossed, and show horizontal lines or grooves produced as the bottle is turned in the mold. These turn-mold attributes are found more commonly on wine bottles.

During the last half of the nineteenth century a plate mold was used to emboss lettering or designs on the body of bottles. In this process a plate with the particular desired motif was inserted into the mold. The plate mold, or slug plate, as it was also known, helped in the standardization of many bottle shapes such as milk bottles.

The Owens automatic bottle machine from about 1904 on produced irregular circular marks, known as cutoff scars (not seams) on the base.

Between about 1930 and 1940 some bottle machines produced what is called a machine-made value mark. This mark is a circle less than an inch in diameter, similar to a seam. It is found more commonly on wider mouth bottles and glass milk containers.

Lipping tools first developed in England c. 1830 and used in America c. 1850 often erased seams on the finish. In this process, which shaped the top of the bottle, a rod was inserted into the bore while the associated clamp on the outside developed the finish as it was rotated. Seams were obliterated by the rotation of the lipping tool; but if the tool was pressed only, seams were produced to the top of the bottle.

Early in the nineteenth century and on, the finish was made by cutting the bottle from the glassblower's rod and reheating the lip or sealing surface to smooth it. In cases where mold seams came to the top of the finish, the seams were obliterated by the reheating. This process produced a flared or fired lip.

A wavy, dimpled, or hammered appearance on a bottle surface is more commonly known as whittle marks because they are thought to have been produced by wooden molds. These marks were actually made by blowing hot glass into a cold mold.

Many hand-blown bottles were finished by a method known as empontilling. When the hand-blown bottle was at its desired shape and cut from the blowpipe, the finish had to be shaped and fire-smoothed. This was done by attaching a glass rod to the base to turn the bottle while the finish was formed. After the finish was completed the rod was broken off, leaving a mark known as a pontil scar or "punty." Three basic types of pontils are as follows:

1. Solid Iron Bar Pontil. This is usually a circular, solid, jagged scar on hand-blown bottles. It could be ground or polished on more refined items.

2. Blowpipe pontil. In this case a glass blowpipe was used to make the finish; when removed it left a ring-shaped but not a solid scar. It too could be polished or ground.

3. Bare iron pontil. This type of pontil is also known as the "improved" or "graphite" pontil. An iron bar was forced into the bottle base, leaving an indentation which could be black, but usually red to reddish black or white. The smooth, circular reddish black mark dates from 1845 to 1870. The white pontil dates between 1870 and 1880. Empontilling was replaced by the snap-case.

The snap-case was a mechanical device that gripped the base of the bottle body. Occasionally it left a mark on the side of the bottle where it squeezed the hot glass a little too hard.

Machine blowing eventually eliminated the need for empontilling, and the automatic bottle machine did away with the snap cases.

Dating

The use of glass dates far back into the history of technology. The history of glass development has been well researched and need not be repeated (Holscher 1965; James 1956; Knittle 1948; McKearin and McKearin 1966; Rensselaer 1926; and others). For the purpose of this study, a brief account of the growth of the glass industry in the United States will be presented. The methods whereby bottles have been dated will also be given in relation to specific bottle characteristics.

The early history of bottle manufacturing in the United States is directly connected with that of England. English bottles were first made about 1557, and shortly after, many carboys and flasks filled with whiskey were sent to the Colonies. Local American industry was discouraged in order to maintain a reliance on the mother country. Demijohn bottles were also shipped to the Colonies, often covered with wicker. These early bottles were free blown (Freeman 1964:15-20).

Holscher (1965:12, Table II) lists many of the more important discoveries of the 16th century. Some of these discoveries are listed here:

1560	*First efforts to reproduce natural mineral water, which became a popular drink for all types of ills.*
1556 to 1572	*Several forms of bottles in Britain: vials, bulbous and conical shapes.*

1600-1700

With the arrival of eight glassmakers in Jamestown in 1608, America's first industry was established. It did not last long, and periodically the London Company sent more skilled glass craftsmen to attempt new starts at producing glass items. In 1621, six Italians were sent, but by 1624 the discouraged glassmakers had all given up, most likely due to the many hardships of the new country. Colonists occasionally tried to succeed in making glassware, as did two citizens of Salem, Massachusetts, in 1639. These ventures were short-lived. All failed because of various hardships or bankruptcy (Glass Containers Manufacturers Institute 1959:16-17).

England made several contributions during this time which aided the glass industry. The year 1611 marked the beginning of the use of a coal-burning furnace, which helped to economize the industry and which later helped in the discovery of lead as a flux. In 1673, sheets of blown glass were made for mirrors and window panes at Lambeth (James 1956:6-8). Crystal glass of lead was made by Ravenscroft in 1676. It was clearer and more brilliant than previous glass (Glass Container Manufacturers Institute 1959:15).

The bottles of this period--the Hogarth (Figure 40b), the Demijohn (cruder than the later one shown in Figure 40j) and others (Figures 40 a-d)--were made of black (dark green) glass, and many had seals impressed in glass on their shoulders. The seals often showed the contents of the bottle, the original owner, and/or a date (Freeman 1964:20). See McKearin and McKearin (1966:424) for the evolution of wine bottles from early to modern times.

Some important developments of this time period pertaining to glass containers listed by Holscher (1965:Table II) are as follows:

ca. 1650	*Refinement of champagne process; use of tight cork stoppers*
1630	*Large glass bottles in Britain*
1650	*English round-bottom wine flasks*
1675-1700	*Cylindrical wine to "bin" early; extensive "string" rims*
ca. 17th century	*Continued wide use of earthenware bottles; displacement of leather or skin bottles by glass.*
1675	*Bottles with strong "kick" (push-up)*
1675-1700	*Bottles for "water, beer, cider, and perry"*

1700-1800

It was during this period that the really successful but short-lived glassmaking firms began to manufacture local wares. Two pioneers stand out.

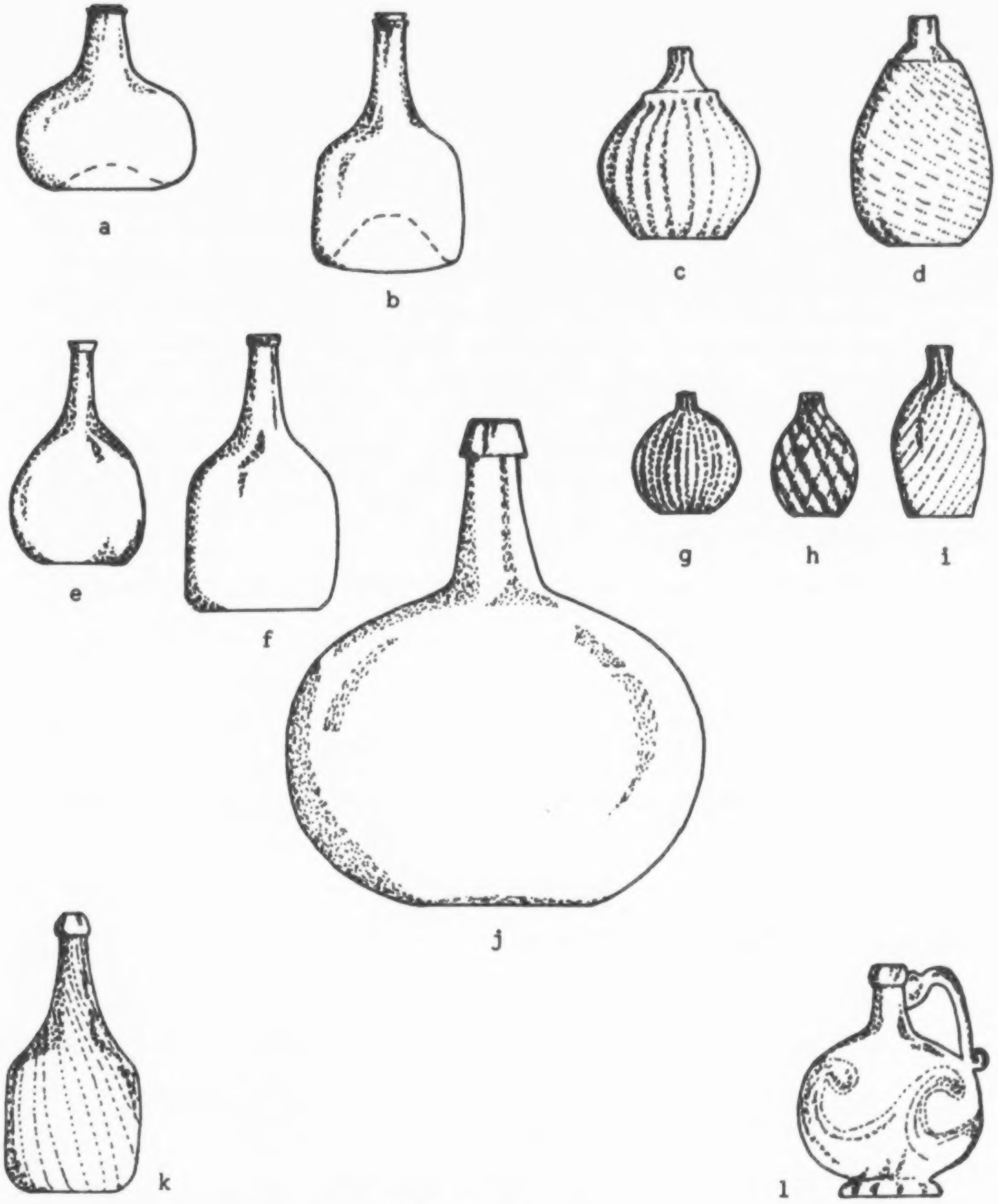

Figure 40.
Early American bottle types. a, Dunmore (ca. 1700); b, Hogarth (ca. 1740); c-d, Pitkin flasks (18th and early 19th century); e-f, Ludlow bottles (18th-19th century); g-i, Chestnut flasks; j, Demijohn; k, Swirled bottle; and, l, Lily Pad Pattern (1850s) (Glass Container Manufacturers Institute 1959:20).

The first was Caspar Wistar, of Salem County, New Jersey, who in 1739 set up America's first successful glasshouse. He produced bottles in various sizes in shades of green and amber (Glass Container Manufacturers Institute 1959:17). Wistar went out of business in 1780. "At first, Wistar made bottles which he sold to traders who were smuggling West Indian molasses into the Colonies in violation of British regulations" (Glass Container Manufacturers Institute nd:9).

The other pioneer of this period was William Henry Stiegel, called the "Baron." He opened his first plant in Lancaster County, west of Philadelphia, in 1763, producing smelling bottles, pocket bottles, flasks, ink bottles, mustard jars, etc. (Glass Container Manufacturers Institute nd:18, 11). Although he landed in debtor's prison in 1774, he had enjoyed tremendous success. It was only through over-speculation, especially during the Revolutionary War, that his firm was forced to enter bankruptcy.

There were other smaller glasshouses at this time, such as Germantown Glassworks, Boston; Glass House Co., New York (1752-1767); and others, but none that produced the quality wares of Wistar and Stiegel.

Typical bottles were the tall and squat bottles with kick-up bases, squat types with long necks, and late types with high kick-ups. Another common bottle type was the Dunmore (Figure 40a).

Holscher (1965:Table II, lists the following events for this period:

1710-1760	*English wine bottles with progressively flatter and larger bottoms and straight sides*
1713	*English decanter, first with cork, then with glass stopper (1735)*
1725-1750	*Use of large glass vessels for manufacture of sulfuric acid (3 to 4 feet high)*
1731	*Rubber bottles of natural gum collected over core in Africa*
1739	*Wistar bottles in South Jersey (USA)*
1750-1770	*American bottles with "flower-pot" body*
1760-1880	*Wine in round and cased bottles; wide mouth jars common in England for pickles*
1763	*Stiegel bottles in Pennsylvania*
17??-1910-19??	*Home canning era; home preserving era*
1777	*"Soda" water at Manchester, England*

1780-1840

> *Between 1780 and 1800 the industry expanded sufficiently to establish itself as an American manufacture. Furnaces were built at Temple, New Hampshire in 1780; at Manchester, Connecticut in 1783; at Frederick, Maryland in 1784; near Albany, New York in 1785; at Boston some time between 1787 and 1792; and at Philadelphia between 1780 and 1786. In addition, two, and possibly three, houses in western Pennsylvania actually blew glass during the 1790's.*
>
> *However, failures in the glass industry were not uncommon even after the Colonial period (James 1956:12).*

Strict controls were no longer exercised on industry when, after the Revolution, the glass industry had a chance to expand.

The first plant was that of the Stanger Brothers, built in 1781 in Glassboro, New Jersey (Glass Container Manufacturers Institute 1959:21).

> *The Pitkin glass house, built in Connecticut in 1783, eventually turned out quantities of glass containers, including the popular 18th century type of ribbed bottles blown in many factories before and after Pitkin's, but known, generally as "Pitkin flasks" (Glass Container Manufacturers Institute 1959:21) (Figure 39 c-d).*
>
> *John Frederick Amelung came to America from Germany in 1784 and established the New Brement Glass Works at Fredericktown, Maryland. Amelung failed in 1796, and some of his workers migrated across the Alleghenies to western Pennsylvania and Ohio to establish a new industry. Glass plants were also operating in New Hampshire, Massachusetts, and Connecticut at the close of the century (Glass Container Manufacturers Institute nd:11).*

In regard to the movement of glass houses during the late 18th century, James (1956:16) states:

> *In 1796 when coal began to be used as fuel for glassmaking in the Pittsburgh area, the industry moved west of the Alleghenies. Next, the Siemens furnace created demand for gaseous fuels in the place of solid fuels.*
>
> *With the discovery of natural gas and cheap oil in western Pennsylvania, the glass factories moved to that region. When natural gas was discovered, first in Ohio and later in Indiana, the glass industry moved even further west. The discovery of natural gas in West Virginia also caused the erection of several large glass plants in that state.*
>
> *In the early days when new sources of natural gas were being discovered, the glass plants moved about from year to year following the gas supply. This was possible because the buildings were of cheap construction and very little machinery was used. This mobility changed after the introduction of both the new type of furnace and the increased mechanization of the industry. Buildings are now larger and most costly; hence the mobility of the industry has decreased greatly.*

To all cities situated along rivers, the steamboat in 1807 made available all types of bottle goods (Glass Container Manufacturers Institute 1959:21).

During this period of American history, patriotism is evident in the enormous quantities of historical flasks sold between 1820 and 1870. The most popular was the American eagle designed with a shield, olive branch and thunderbolt, and second in sales was the George Washington flask (Glass Container Manufacturers Institute 1959:22).

The most common feature of bottles before 1820 is the crude blow-over finish formed by simply cutting the container free from the blow pipe--also called a "sheared lip" (Kendrick 1966:28). Other popular bottles included the Ludlow (Figures 40e-f), Chestnut flasks (Figures 40g-i), and the swirled bottle (Figure 40k).

Important developments are (Holscher 1965:Table II):

1783	*The famous Pitkin flasks (double gather) in Connecticut*
1785-1840	*Large production of lamp chimneys*
1797	*Marmalade in ceramic jars in England--soon in glass*
1800-1810	*The mineral bottle with a pointed bottom to lay on side for wet cork*
1800-1870	*The American Historical Flask Period*
1807	*"Soda" water at New Haven, Connecticut*
1810	*Peter Durand's British patent on food canning*
1810-1820	*Preserving (commercial) in glass in France, England, and America*
1810-1830	*Syrups for flavoring drinks*
1811	*Invention of the metal mold in England*
1820	*"Soda Water" term common in USA*
1821	*English patent on split iron mold, to shape whole bottle (externally)*
1825	*Hand-operated glass press*

1840-1860

With the glass industry in full bloom, diversification began to take place and new inventions were produced to satisfy the demands of consumers.

The bottles of this period and earlier were formed by open molds in which only the body was formed. The neck and finish had to be shaped by hand. This type of mold leaves a seam on the bottle body which terminates on the shoulder or the low neck (Kendrick 1966:47). It was the practice of glassmakers to form finishes by applying a strip of glass around the sheared end of the neck. The manufacture of free-blown bottles died out around 1860, so that the seamless bottles of irregular shapes are seldom encountered after this date.

A common feature up to 1860 on ordinary utility items was pontil marks. This mark, found on the bases of bottles, consisted of an area somewhat circular, rough and sharp where a glass rod had once been attached to maintain control during the hand-making of the finish.

Between 1850 and 1860, the pontil was gradually replaced by the snap-case. The rod was not physically attached to the bottle base, but rather a tong that snapped tight to the bottle heel was used; when removed it left no marks on the base. This left the base free for lettering or decoration (Kendrick 1966:29).

There was little concern over the color of glass until food-stuffs began to be bottled. Then came the desire to see what was in the bottle, so glass had to be made lighter. Dark olive-green or black glass, common up to 1860, began to be replaced by clearer and lighter colored types of glass. A common container of this period was a jug with the lily pad pattern (Figure 41).

Noticeable events during this period recorded by Holscher (1965: Table II) are:

1841	*Nursing bottle patent*
1850	*Common use of the term "pop"*
1851	*The consumption of over a million bottles of "soda" at Crystal Palace, London Exposition*
1854-1855	*Arthur patents on Groove Ring Jar and Can*
1857-1900	*The era of the search for a commercial closure*
1857	*The "snap" case--making "pontil" mark unnecessary on hand-made glass bottles*
1858	*"Tonic" water and "Ginger Ale" in Ireland; Borden patent on glass Groove Ring Jar; the Mason Jar*

1860-1880

> *Records available for the year 1860 show that the product of glass factories in the United States did not exceed $7,000,000. The years 1861 and 1862 were depression years due to the Civil War. However, between 1862 and 1870 there was a marked*

> *increase in production, and the census of 1870 showed 154 establishments with 15,367 employees producing glass valued at $16,470,507 and with a capital investment of $13,826,142. Also during the decade, great improvements were made in the manufacture of pressed glass. Common tumblers were one of the major products made from pressed glass (James 1956:13).*

The manufacture of bottles was still relatively difficult to the glass container producer. One labor-saving and time-saving device used from 1809 was the three-piece mold with its characteristic seam around the body just below the shoulder, besides a perpendicular seam. Most glass factories that required the skilled glass-blowers were small in size. Even as late as 1880, mixing of the glass batch was still done by hand. Noticeable accomplishments that did take place were in the improvement of the furnaces. According to James (1956:14),

> *As late as 1870, most furnaces were of the old fashioned round variety in which the coal was pushed up from below. Increased production was needed, and the spur of completion led to the adoption of the Siemens furnace which had been introduced in Germany in 1861. Prior to this time, only the direct firing of either dried wood or coal had been used.*

A modification of the Siemens furnace (an open-hearth furnace for melting iron in large quantities under oxidizing conditions) produced the rank furnace, which gave great impetus to the revolutionizing of the glass industry. The economy of this furnace is seen in its durability, since previously used clay pots, expensive and impermanent (they lasted only about seven weeks), were used to mix the batch (James 1956:15).

A crude method of pressing and blowing water pitchers was first patented in 1865 by William T. Gillinder. Another patent for a blow and press pitcher device was issued to a man named Atterbury, a Pittsburgh glassmaker, in 1873. Both failed or had little commercial use (James 1956:15-18).

The bottles of this period were still produced by somewhat crude manufacturing techniques, but a change was beginning to take place. Colors were still somewhat unimportant, though they were more refined and lighter. Also, clear glass containers grew in importance around 1880. There may have been a refinement in finish preparation, because mold seams of this period end just below the finish (Figure 37k), an obvious indication that the finish was made separate from the body (Kendrick 1966:47).

An important characteristic of some bottles that first appeared in 1869 was that of embossing them with the names of contents, manufacturers, distributors, slogans, and messages. This practice nearly died out with the advent of automatic bottle machines (1903); paper labels were used extensively on bottles made from such machines (Kendrick 1966:71).

Beer bottles were found in the West only after 1873. As stated by Woodward (1959:126-127), "pasteurization of beer is a prime requisite for the proper bottling of beer and since Pasteur's process did not come into active use in the brewing business until 1873, we can safely assume that no bottled beer was shipped to Ft. Union or any other place in the United States prior to that year."

Additional events of the time listed by Holscher (1965:Table II) are:

1860	*Hemingray groove ring mold construction*
1863	*Pasteur's work on preservation*
1870	*Brewery test by Pasteur (Copenhagen)*
1873	*The Illinois Glass Company*

1880-1900

James (1956:18) relates some important events of this period:

> *After experimenting for some ten years, Phillip Arbogast secured patents in 1881 on a double-mold method which was the forerunner of the successful machines which began the mechanical revolution in the glass container industry.*

He further states:

> *In 1885, the D.C. Ripley Glass Company of Pittsburgh acquired the rights to the Arbogast patent and produced a few containers. Because of union troubles, however, Ripley put aside the machines that had been built. Not until 1902 was the next step taken, when a glassmaker named Dos Taylor began to make wide-mouth ware in the non-union shop in Huntington, West Virginia. The next year the United States Glass Company, which had acquired the Arbogast patent, granted a license to the Enterprise Glass Company for the production of vaseline jars.*
>
> *Thus, up to about 1892 practically all of the bottles manufactured in the United States were made by hand blowers and the introduction of machinery had not received serious consideration. During the period between 1892 and 1904, several bottle-making machines were tried, some of which were put into successful operation, supplanting a certain number of hand workmen.*
>
> *The principal difference between the newly introduced machine and the old hand blowing method was not so much the reduction of the number of helpers needed as the elimination of the greater part of the skill required from the skilled blowers engaged in the hand process.*

Speaking of further developments in this time period, Kendrick (1966: 43) states:

> *The German glassmakers were known for their use of wooden molds. This practice was most popular in the US between the years of 1820 and 1865. Although the wooden*

> *molds were kept wet to prevent them from igniting, they did burn out fast. As the red-hot glass came into contact with it, the walls of the mold became charred. It was discovered accidentally, that by turning the charred mold while the bottle remained inside, all mold marks would be obliterated. This made a prettier bottle, which had more luster, and resembled a free-blown one. These bottles were preferred and demanded by many bottlers, especially the winemakers. When metal molds replaced wooden ones, the manufacturers put a paste inside the molds which allowed the bottle to slide when the mold turned over. Thus, the term "turn molds" or "paste molds." These molds were invented about 1860, but their use became most common between 1880 and 1900.*
>
> *Turn-mold machines, important inventions of the early 1900s are of a necessity for the production of light globes, tumblers and lamp chimneys. The practice of producing bottles in turn molds, however, seems to have ended with the advent of machinery.*

The common mold of this period was the closed mold in which the entire bottle, except the upper section of the finish or lip, was mold-made. On these bottles, the seam ends at about the middle of the neck. The contours of the finish became more controlled and standardized, resulting in more uniformity of closures (Kendrick 1966:47-48).

> *In 1892, a semi-automatic process called "press and blow" was invented, which was adaptable only to the production of wide-mouthed containers. In this method, the glass was pressed into the mold to form its mouth and lip first. Then a metal plunger was forced through the mouth and the air pressure was applied to blow the body of the vessel. This process was used for the production of fruit jars and also our early milk bottles. It was not adaptable to narrow-necked bottles because of the "bottleneck." The necks were too small to allow the use of the metal plunger. So our conventional screw-topped bottle did not become common until after 1924, when the glass industry standardized the threads (Kendrick 1966:51).*
>
> *By 1896, the first of the new semi-automatic machines was in successful operation at the Atlas Glass Works, and in 1898 Ball Brothers installed a similar machine for the making of fruit jars (James 1956:19).*

Holscher (1965:Table II) lists the following developments:

1880-1925	*Extensive home canning*
1880-1890	*The principles of Press and Blow (1882 USA) and Blow and Blow process (1885 England)*
1884	*Thatcher milk bottles; very slow in acceptance; complete adoption after World War I*
1885-1910	*A very wide range of closure concepts*

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1886	*Bulk dispensing of Coca-Cola in Atlanta, GA*
1888	*Libbey in Toledo*
1890	*Regenerative furnace in USA (invented in 1860)*
1890-1915	*The semi-automatic era for Press and Blow and Blow and Blow process*
1896-1900	*Bottled Coca-Cola at Vicksburgh, Mississippi, Chattannoga (1899) and Atlanta (1900)*
1897	*The vacuum gather of glass*

In addition, Ferraro and Ferraro (1964:79) have provided the following table for dating bottles:

100 B.C. to 1860	*Free blown bottle*
1618-1860	*Pontil scars*
1800-1860	*Wooden mold (whittle marks)*
1800-present	*Raised letters*
1809-1890	*Three-piece mold*
1810-1917	*Purple or amethyst glass*
prior to 1820	*Heavy sheared lip*
1840-1860	*Crudely applied lip, reheated*
1850-1870	*Graphite pontil*
1850-1890	*Snap case (began replacing pontil)*
1870-1880	*Smoothly applied lip*
1860-1903	*Paste mold*
1880-present	*Annealing device or lehr*
1903-present	*Automatic bottle machine (seams pass through lip)*

1900-1940

D. James (1956:17-18) divides this time period into three phases:

> *(1) 1898 to 1906--semi-automatic machinery for the making of wide-mouth ware exclusively; (2) 1905-1917--the Owens automatic machine for the making of all kinds of bottles, wide and narrow mouth, and semi-automatic machinery for the narrow mouth ware; and (3) 1917 onward--semi-automatic machinery made automatic by the "feed and flow devices."*

At beginning of the twentieth century, a new phase of bottle manufacture commenced.

> *Through the cooperation and financial backing of the Toledo Glass Works, the Owens machine was perfected in 1903. At first, the Owens machine made only heavy bottles, which were wanted in great number. In 1909, improvements allowed it to make small prescription bottles. By 1917, other completely automatic bottlemaking machines had been invented, and bottles were formed automatically throughout the civilized world.*
>
> *Characteristically, bottles formed by the Owens machine will have heavy bottoms, thick even walls, and the seams of the neck molds will not line up with the seams of their bodies.*
>
> *A distinguishing mark left by the Owens machine is a shallow wrinkle in the glass which forms a circle in the base of the bottles. The ring probably is off center and may complete its circle by extending up the sidewalls of the bottle.*
>
> *This "Owens ring" formed when the glass, which was sucked up into the lip mold, was cut off from the rest of the glass in the pot (Kendrick 1966:81).*

Before 1917, the only fully automatic bottle machine was the Owens, but after this, the importance of the Owens machine decreased. After 1917, the semi-automatic machines greatly decreased in the United States. Between 1916-1924 the Hartford-Empire Company was developing the gob feeder machine (James 1956:21-23). Kendrick (1966:83) describes this device as follows:

> *In 1917 an important invention of mechanized bottle production (not used by the Owens machine) was a way of forming a measured amount of molten glass from which a bottle could be blown. It is called a "gob feeder." In this process, a gob of glass is drawn from the tank and cut off by shears. Bottles which have been formed from such a gob, may show a design in the center of its base like a "V" with straight lines radiating out at right angles from the "V".*

Bottles produced by the automatic machine have a mold seam that extends to the bore of the finish (Figure 371). By 1920, bottles were refined in that bubbles were eliminated and the thickness of the glass made more uniform.

Manganese was used in bottle glass up to about 1917 in order to give the glass a clearer effect. After this date, ultra-violet rays of the sun would not turn glass "purple," a change caused by the manganese content of the glass. Just when manganese began to be mixed with the glass is not definitely known, but it may date back as far as 1810 (Ferraro and Ferraro 1964:79). Newman (1970:74) suggests a beginning date of 1880 and a terminal date of 1925.

Pertaining to amber glass, Kendrick (1966:59-61) states:

> *With the advent of World War I, our main source of manganese (German suppliers) was cut off. In the U.S. bottle industry, selenium became the predominant chemical used to bleach out the unwanted iron-produced aqua color from the glass. A change-of-color event takes place in this glass which has a high selenium content. With exposure to sunlight its clear appearance changes to an amber hue, or, as I would describe it, the color of ripened wheat. It never gets any darker than a good grade of honey, and there is no need to confuse with a brown bottle.*

A characteristic embossing that takes place after 1933 is described by Ferraro and Ferraro (1966:56-60):

> *At the time of repeal of prohibition in 1933, the evils characteristic of the pre-prohibition era were well remembered and fresh in the minds of legislators, such antics as a saloon putting cheap whiskey in a bottle with a superior brand name or even bootleggers and moonshiners paying janitors of apartment buildings for empty liquor bottles. As a result, almost every conceivable safeguard or device which would avoid recurrence of those practices was included in Federal legislation. One of the basic changes which was brought about by repeal of prohibition was the type of packages which could be used at the consumer level. The new legislation restricted the sale of distilled alcoholic beverages at the retail level to glass containers of one gallon capacity or less. To avoid or prevent tax evasion, misbranding and adulteration, the law provided that liquor containers must bear the phrase "Federal Law Prohibits Sale or Reuse of This Bottle." The new legislation prohibited absolutely the reuse of liquor ware in any manner.*

The deterioration of pre-1930 glass exposed to the elements, called "opalescent glass," resulted in smokey opaque flakes on the bottle surface. This process is described by Plenderleith (1956:335):

> *The decomposition of glass is generally accompanied by the liberation of free alkali, and the form taken by the disintegration will be determined by the nature and amount of the alkali liberated. Free alkali is more or less hygroscopic, and liberation of lime and soda will cause deposition of moisture. Carbon dioxide will be absorbed from the atmosphere by this moist alkali, with the result that an incrustation of alkaline carbonates is gradually laid down, interspersed with silica and with tiny flakes of semi-decomposed glass, the result being the creation of a surface that is opalescent.*

At the turn of the twentieth century, a number of liquor flasks were in use. A few shapes are illustrated in Figure 41.

For this time period, the important events were (Holscher 1965: Table II):

ca. 1900-1910	*Advent of wide usage of food in glass*
1900-1920	*Extensive use of metal screw closures*

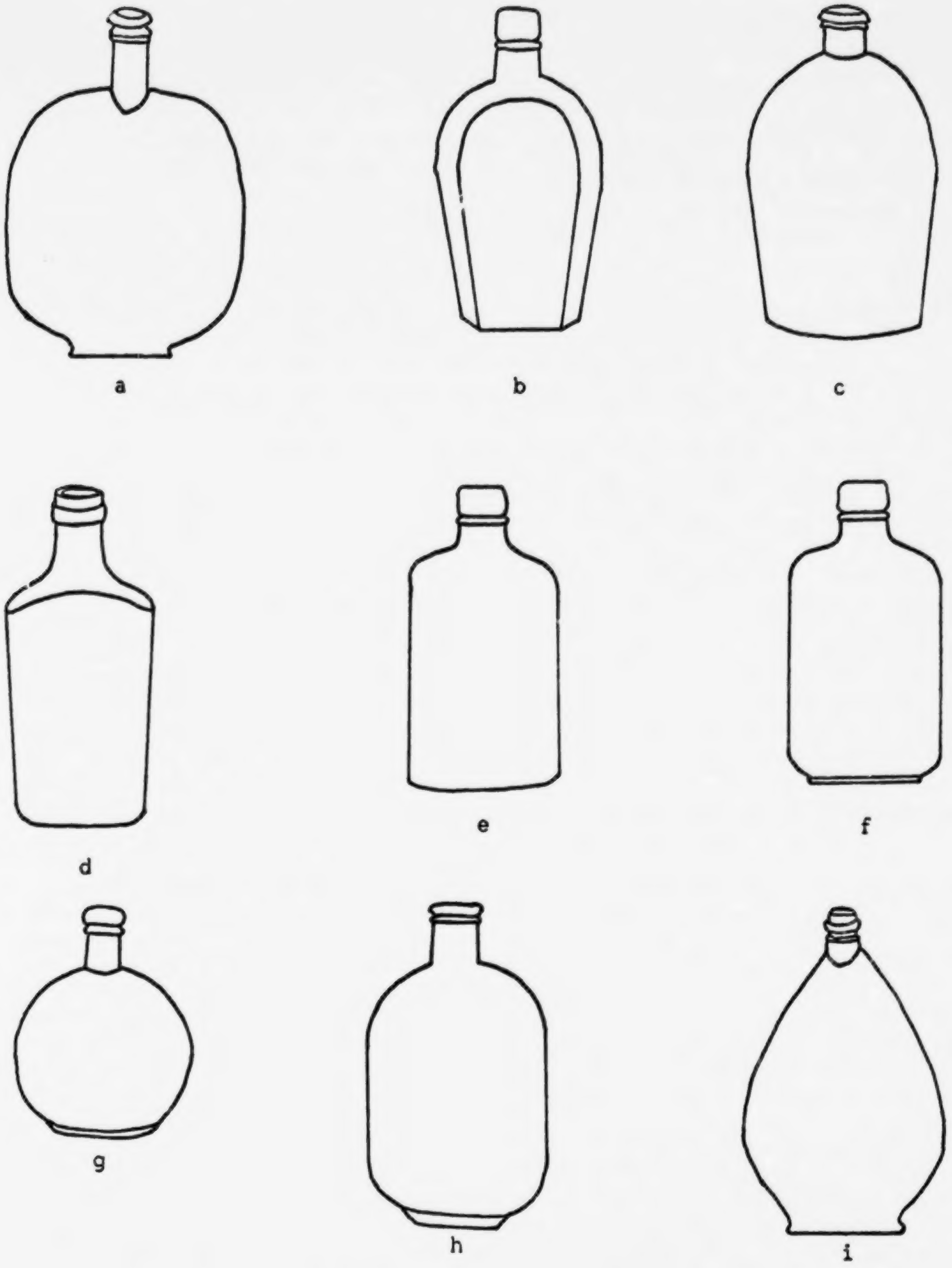


Figure 41.
Beverage ware flasks for liquor. a, picnic; b, shoo-fly; c, union oval; d, olympic; e, Philadelphia oval; f, eagle; g, oval; h, Cummings; and, i, tear drop.

1900	*Owens power drive*
1902	*Revolving pot (tank); first newspaper advertising of Coca-Cola*
1903	*The Owens Bottle machine--"Vacuum and blow"--"Suck and blow" USA--1903; abroad--1906/1908*
1905	*Bottle filling and capping machinery*
1912	*Crown cap universal for carbonated beverages*
1919	*Machine-made bottles still heavier than hand-made bottles; the Owens Bottle Company*
1920	*Complete transition to "crown" for beverages*
1920-1930	*Era of design of bottles for branded soft drinks*
1920-1930	*Era of wide range of commercial closures, replacing cork stoppers; glass standardization*
1922	*Six-bottle carton for Coca-Cola*
1922-1926	*The plastic closure (bakelite)*
1924	*8 oz. and 10 oz. bottles for soft drinks*
1926	*Beginning of the baby food era (by 1939 largely in glass)*
1929	*The Owens-Illinois Glass Co.*
1930-1931	*The "steam vacuum" process by steam injection; sealing jars*
1930-1935	*Standardization of wide range of bottle finishes and closures*
1932	*Application of color lettering (ACL)*
1933	*The "light-weighting" program underway*
1934	*Wide use of 12 oz. bottles for soft drinks*
1938	*Non-returnable beer bottles*
1939	*Standardized testing for uniformity of bottle glass-float density*

1940-Present

Most of the glass in common use today is one of three types:

(1) Lime glass:

Contains a large porportion of lime and soda or other alkalis. Between 80 and 90 percent of

> *all glass used in the home is of this durable, inexpensive variety. Drinking glasses, milk bottles, jars and containers, and window panes are just a few examples of its varied applications.*
>
> *(2) Lead glass:*
>
> *Contains a substantial amount of lead oxide and potash or other alkalis. Most often used for more expensive, quality tableware and decorative pieces.*
>
> *(3) Gorosilicate glass:*
>
> *Is heat-resistant glass used for cookware and baking dishes, in which a small percentage of boric oxide helps prevent expansion and cracking under temperature change (Glass Institute of America nd:3).*

Some modern glass companies are readily identifiable by characteristic manufacturing attributes produced by the type of machine used or by specific patented shapes. Sometimes only the company that used the bottle can be established, since the manufacturer placed the product's name on the bottle and not his own. During the twentieth century, it has been a common practice to place the company's trademark on the bottle--usually on the base. For example, the Owens-Illinois Company was formed by the merger of the Owens Bottle Company and the Illinois Glass Company in 1929. The trademark of the Illinois Glass Company was an "I" in a diamond, with the long dimension of the diamond horizontal. The Owens Bottle Company had an "O" inside a square. After the merger, the trademark consisted of a combination of these two marks. This same trademark was used in 1941 when the term "Duraglas" was added. In 1954, the present trademark (an "I" within an "O") of the Owens-Illinois Company was adopted (Holscher 1967).

Underneath the trademark, another number identifies the mold in which the bottle was made. Holscher (1967) explains the mold numbers as follows:

> *These numbers would go up the number of mold cavities made which might be, say from 1 to 22. They would be plain numbers if there was one mold cavity in each mold casting. However, many of our bottles are made in mold castings which contain two or three cavities. A plain number could also indicate the front cavity of a two or three cavity mold. A dot after the number indicates that the bottle is made in the rear cavity of a two or three cavity mold. If two dots follow the number, this would indicate quite recent production in which the bottle is made in the middle cavity of a three cavity mold.*

Other companies have similar marking systems. For example, the Glass Containers Corporation has the overlapped "G" and "C," the company trademark, on the base. Just below it to the left is the plant number, while to the right is the year of manufacture. Still lower to the left is the mold pair number, and at the bottom of the base is the mold or job number. Each glass company has its own layout, but that above may be representative.

Holscher (1965:Table II) lists the following developments in the modern glass industry:

1940-1950	*Extensive studies on temperatures of bottle forming*
1945	*Bubblers in use in tank for homogeneity; the square milk bottle*
1948	*Larger capacity soft drink bottles; non-returnable soft drink bottles*
1953	*Synthetic sweetners of soft drinks*
1954	*Silicone coatings*
1954-1958	*Plastic coated bottles for aerosols*
1959-1961	*The advent of rigid polyethylene containers*
1963	*Wide use of low-calorie soft drinks*

The trademarks of some of the more prominent glass firms of our time are illustrated in Figures 42 and 43.

Bottles From Simpson Springs

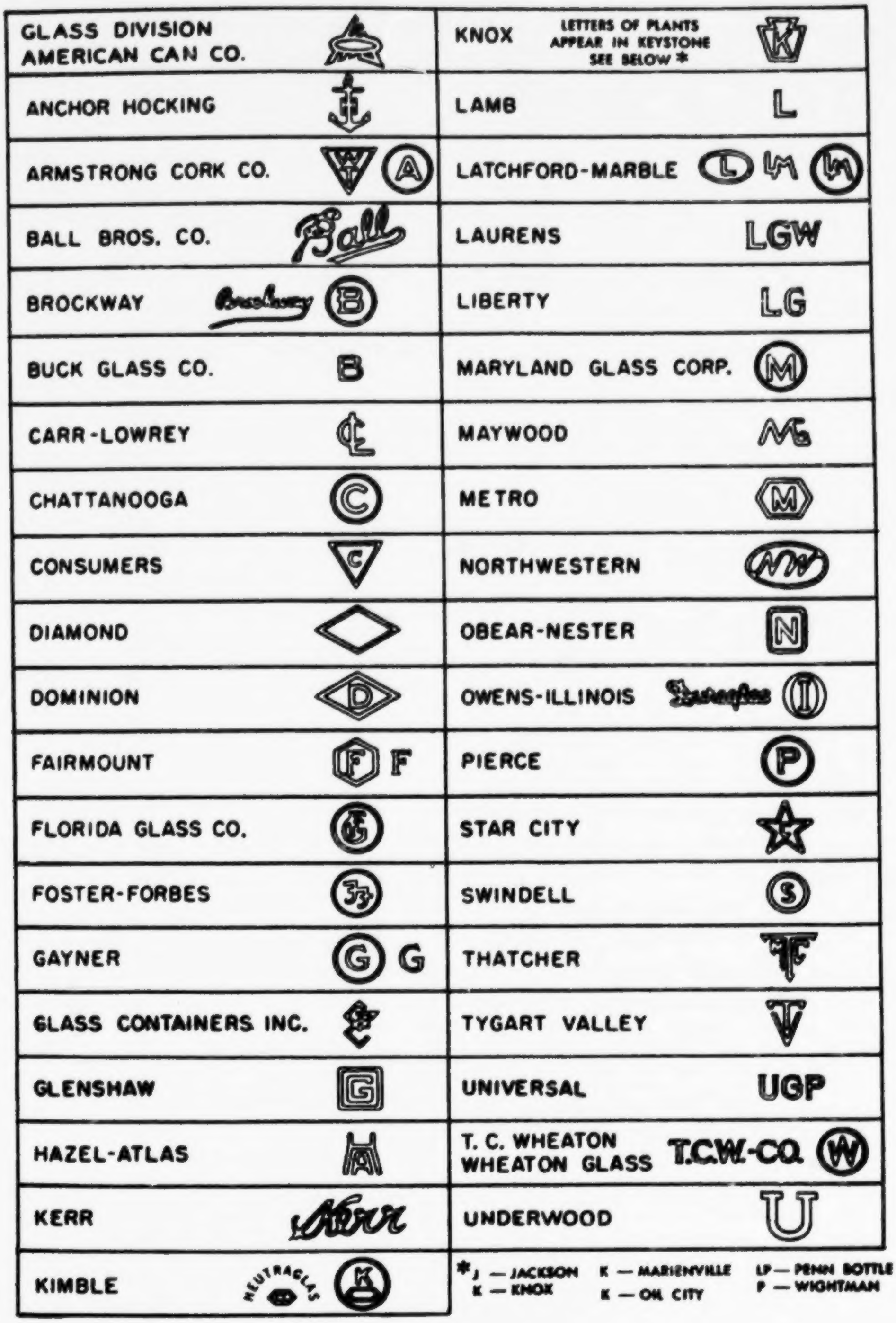
Several hundred broken pieces of glass bottles were recovered in the four structures excavated at Simpson Springs. These fragments included clear glass, purple glass, and glass colored in shades of aqua blue, brown, light and dark green and olive green, including "black" glass (Table 3).

Glass can be produced in practically all colors by adding specific ingredients to the basic glass mixture. Munsey (1970: 37) suggests that the color of glass was obtained by adding the following compounds:

copper, selenium, gold	reds
nickel or manganese	purple (amethyst)
chromium or copper	greens
cobalt or copper	blues
carbon or nickel	browns
iron	greens, yellows
selenium	yellows, pinks
tin or zinc	opal or milkglass
iron slug	"black glass"

In order to obtain clear glass, the raw materials should be free of impurities in the sand. Very dark greenish-amber glass ("black glass") was popular until the middle of the nineteenth century. Before the

Trademarks of Glass Container Companies



GLASS DIVISION AMERICAN CAN CO.	KNOX LETTERS OF PLANTS APPEAR IN KEYSTONE SEE BELOW *
ANCHOR HOCKING	LAMB
ARMSTRONG CORK CO.	LATCHFORD-MARBLE
BALL BROS. CO.	LAURENS
BROCKWAY	LIBERTY
BUCK GLASS CO.	MARYLAND GLASS CORP.
CARR-LOWREY	MAYWOOD
CHATTANOOGA	METRO
CONSUMERS	NORTHWESTERN
DIAMOND	OBEAR-NESTER
DOMINION	OWENS-ILLINOIS
FAIRMOUNT	PIERCE
FLORIDA GLASS CO.	STAR CITY
FOSTER-FORBES	SWINDELL
GAYNER	THATCHER
GLASS CONTAINERS INC.	TYGART VALLEY
GLENSHAW	UNIVERSAL
HAZEL-ATLAS	T. C. WHEATON WHEATON GLASS
KERR	UNDERWOOD
KIMBLE	*J — JACKSON K — MARIENVILLE LP — PENN BOTTLE K — KNOX K — OIL CITY P — WIGHTMAN

Figure 42.
Trademarks of modern American container companies (Owens-Illinois 1964).

Trademarks of Foreign Container Companies

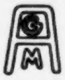
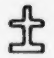
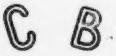
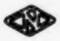
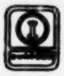
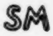
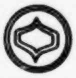
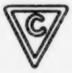
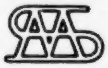
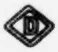
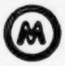
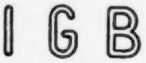
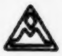
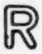
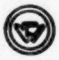
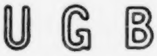
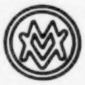
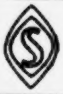
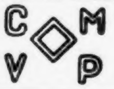
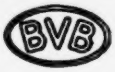
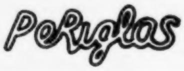
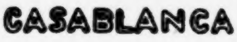
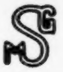
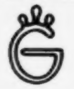
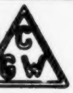
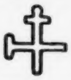
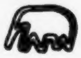
AUSTRALIAN GLASS MFRS. AUSTRALIA		HEYE SCHAUENSTEIN GERMANY	
COMPTOIRADES BOUTEILLERIES BELGES BELGIUM		NIPPON GLASS JAPAN	
DUROBOR, S.A. BELGIUM		YAMAMURA GLASS JAPAN	
VID. SANTA MARINA BRAZIL		YOKUNAGA GLASS JAPAN	
CONSUMERS GLASS CANADA		SAN MIGUEL BREWERY MANILA	
DOMINION GLASS CANADA		CRISTALES MEXICANOS MEXICO	
IRISH GLASS BOTTLE EIRE		CARTEL VIDRIERA MEXICO	
ROCKWARE GLASS ENGLAND		CARTEL VIDRIERA GUADALAJARA MEXICO	
UNITED GLASS BOTTLE ENGLAND		CARTEL VIDRIERA MONTERREY MEXICO	
VERRERIE SOUCHON-NEUVESEL LYON, FRANCE		CIA. MANUFACTURERA DE VIDRIO DEL PERU PERU	
VER. BEAUCE-BOURGOONE FRANCE		PUERTO RICO GLASS PUERTO RICO	
VER. DE L'OCEAN FR. MOROCCO		SINGAPORE GLASS MFRS. SINGAPORE	
GERRESHEIMER GERMANY		CONSOLIDATED GLASS WORKS SOUTH AFRICA	
GLASWERKE RUHR GERMANY		THAI GLASS MFRS. THAILAND	

Figure 43.
Trademarks of modern foreign container companies (Owens-Illinois 1964).

Glass Color	AQUA					CLEAR				PURPLE				GREEN				BROWN				BLACK		Cobalt Blue	White (milk)		
Bottle Fragment Provenience	Flat Glass	Body	Finish	Base	Whole	Body	Finish	Base	Whole	Body	Finish	Base	Whole	Body	Finish	Base	Whole	Body	Finish	Base	Whole	Body	Base	Whole	Base	Glass Totals	Bottle Totals
STR. 1, Rm. 1	21																									21	-
Rm. 2	292																									292	-
Rm. 3		10				8		1		31	1	2		23	1			10		1						88	88
North	13	2												5				5	1							26	13
South		11								22				4				2							1	40	40
Posts																		1								1	1
STR. 2	2	3	2			14				24		3		33	2	1		3				4	1			92	90
STR. 3	151					1																				152	1
STR. 4	125	260	14	21	4	1411	33	23	8	161	26	20	10	380	8	12	1	330	10	11	1		1	1		2871	2746
TRENCH B	2					46				42				68				57								215	213
TRENCH C		2				1				2				19				1								25	25
TOTALS	606	288	16	21	4	1481	33	24	8	282	27	25	10	532	11	13	1	409	11	12	1	4	2			3823	3217

TABLE 3

Summary of Glass Artifacts

turn of the century, bottles were predominantly green and aqua. Munsey (1970:37) further states:

> *A number of variables can affect the actual color produced including the amount of the compounds used, the degree to which the basic glass mixture is impure, the temperature and the time-temperature relationship, and the reheating necessary to complete a piece of glass.*

In the late nineteen hundreds much of the glass sand, which came from Belgium as ballast for ships, was pale green. This may account for many bottles being this color, though it was not desirable for many products. This glass was decolorized by the addition of manganese, which causes glass to turn purple to amethyst when exposed to the ultra violet rays of the sun (Jones 1965a:40).

A total of 3823 pieces of glass, either flat or bottle glass, were discovered during the course of excavation of these sites. Of this total 3217 represented bottle glass. It is estimated that the sum total of bottle glass may represent approximately 100 to 120 bottles. All of the whole or partly restored bottles, which numbered 63, came from Structure 4; in fact, approximately 85 percent of the bottle glass came from this same structure.

In addition to the whole and partly restored bottles, there were 98 finishes, 95 bases and approximately 3006 body fragments, including shoulder specimens. Most of the glass, 154 specimens, was clear; however, the purple glass (344 specimens) was undoubtedly clear prior to disposal. Aqua-blue glass numbered 329 specimens, green glass 557 specimens, brown glass 433 specimens, black (dark olive-green) six specimens, and cobalt blue and white glass one specimen each, for a total of 3217 bottle glass specimens. Most of the glass was transparent but several pieces were opalescent, which is not a manufactured characteristic. It results from the leaching by moisture of the soda and lime in exposed glass, leaving a silicate skeleton (Munsey 1970:53).

Fontana (1978:46) suggests that concern should be taken in two areas when analyzing bottles: (1) the maker of the bottle and, (2) the contents. In order to approach the study of the bottles from Simpson Springs in this fashion, the physical description of the bottle is presented, including manufacturers marks, embossed data, and historical information. The descriptive data are based on the types of characteristics presented at the beginning of the chapter. The functional interpretations are based on a classification derived by Fike (1965): (1) alcoholic beverage, (2) non-alcoholic beverages, (3) bitters, (4) pharmaceuticals and cosmetics, (5) household products, and (6) miscellaneous types.

Dating has been attempted by the use of physical attributes, manufacturer's date of operation, and a dating key devised by Newman (1970). In this dating key the most common dates used were those of the semi-automatic bottle machine (1880-1913); two piece mold (1845-1913); and, purple glass (1880-1925). For this reason many of the Simpson Springs bottles fall into the dating range of 1880 to 1913.

Special names of bottle types have been derived from Putnam (1965). Although manufacturers had specific names and uses in mind for their bottles, the purchaser may have actually used them for something quite different.

Whole or Restored Bottles

I. Alcoholic beverage bottles

A. Large whiskey

1. Figure 44a

Special name of bottle type: Chicago Fancy Brandy
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--purple; closure--cork (?); finish--brandy; body--cylindrical; base--round border; neck--bulb; bore--cylindrical; collar--present; mold--cup-bottom; heel--rounded; shoulder--rounded
Measurements: height--29 cm; bore--1.8 cm; base--8.2 cm; body--8.2 cm; neck--3.4-4.2 cm
Markings: designs--vertical relief lines of glass; place--heel and shoulder
Compare: Blumenstein (1965:19 and 1966:18)

2. Figure 44b-c

Special name of bottle type: Ohio Brandy
Dates bottle in use: 1897-1920
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--cork (?); finish--brandy; body--cylindrical; base--round border push-up; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: height--29.7 cm; bore--2 cm; base--8.5 cm; body--9.1 cm; neck--3.1 cm.
Markings: type--embossing; lettering--(body) THE HAYNER DISTILLERY CO. DAYTON OHIO & ST. LOUIS MO. DISTILLERS (base) DESIGN PATENTED NOV 30TH 1897; design--concave fluting on the heel and shoulder
Manufacturer: The Hayner Distillery Company, Troy, Ohio; dates in operation--1856-1920
History: Regarding this company Newnham (1974:34) states,

> "The Hayner Distilling Company operated in Troy, Ohio from 1856 to 1920. The original distillery began in 1856 in Farrington which is a few miles north of Troy. This early distillery was relocated in Troy in 1866. After enactment of the 18th Amendment, the distillery was closed."

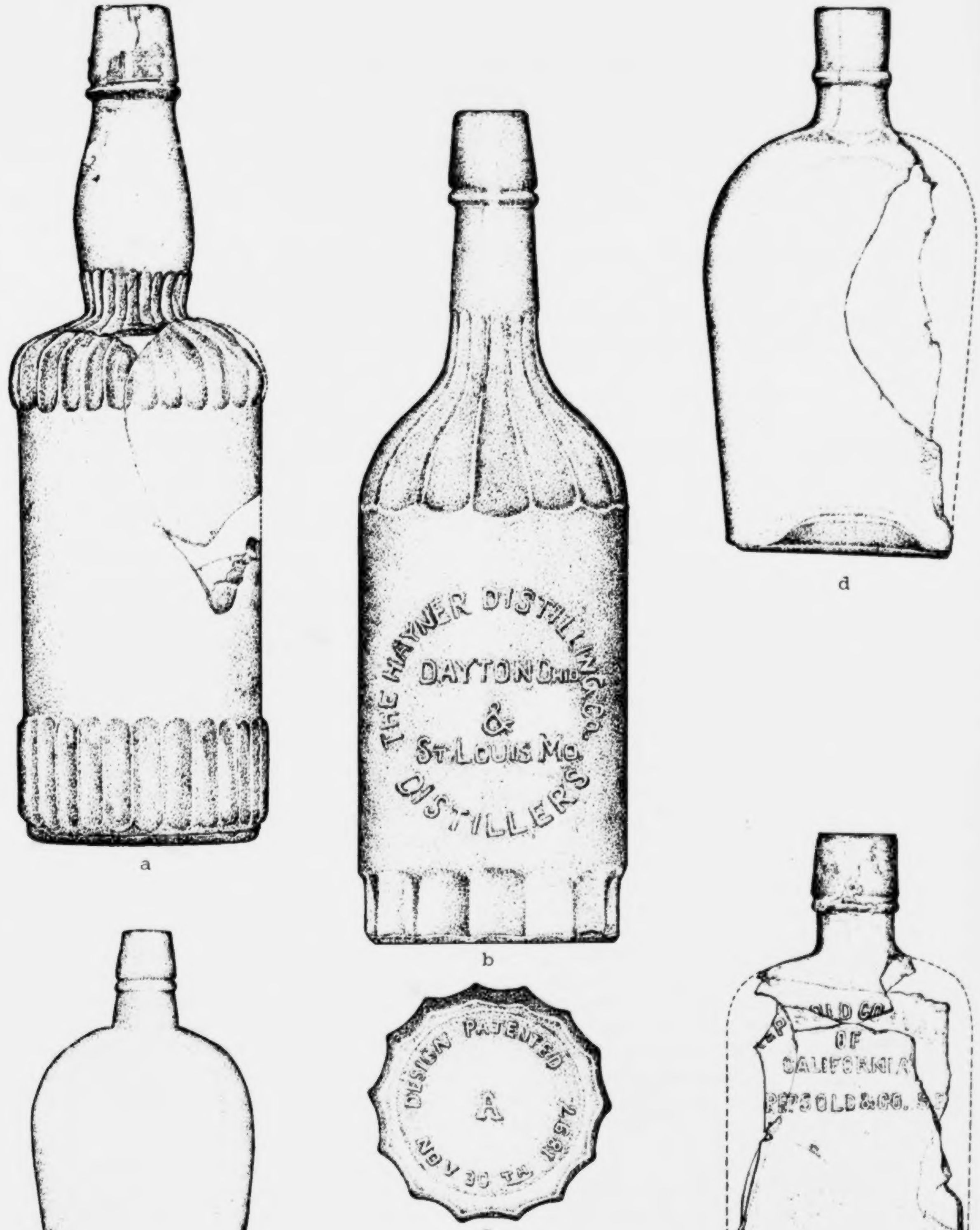

a
THE HAYNER DISTILLING CO.
DAYTON OHIO
&
ST LOUIS MO.
DISTILLERS
b
DESIGN PATENTED
A
NOV 30 TH 1897.
c
d
e
OLD CO
OF
CALIFORNIA
REPSOLD & CO.
f

Figure 44.
Whole or restored bottles:
alcoholic beverages.

Distribution points were located at Dayton, St. Louis, St. Paul, Atlanta and Kansas City.
Compare: Blumenstein (1965:20); Newnham (1974:34); Fike (1965:5)

B. Flasks

a. Figure 44d
Special name of bottle type: Shoo-fly flask
Dates bottle in use: 1880-1925
Provenience: Structure 4
Manufacturing techniques: glass color--purple; closure--cork; finish--brandy; body--oval; base--oval border; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup bottom; heel--straight; shoulder--rounded
Measurements: height--19.6 cm; bore--1.7 cm; base--3.8 cm X 7.6 cm; body--3.8 cm X 10.2 cm; neck--2.5 cm
Compare: Blumenstein (1965:29 and 1966:30)

2. Figure 44e
Special name of bottle type: Shoo-fly flask
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--cork; finish--brandy; body--oval; base--oval border; neck--tapered cylindrical; bore--cylindrical; collar-present; mold--cup-bottom; heel--tapered; shoulder--rounded
Measurements: height--15.2 cm; bore--1.3 cm; base--3.2 cm X 6 cm; body--3.2 cm X 8 cm; neck--2.4 cm
Compare: Blumenstein (1965:29 and 1966:30)

3. Figure 44f
Special name of bottle type: Brandy flask
Dates bottle in use: 1860-1913
Provenience: Structure 4
Manufacturing techniques: glass color--light green; closure--cork; finish--brandy; body--oval; base--oval flat; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: height 19.2 cm; bore 1.8 cm; base 7.3 cm X 2.2 cm; body 8.4. cm X 2.9 cm; neck 2.1 cm
Markings: type--embossing; lettering--REPSOLD COGNAC OF CALIFORNIA / REPSOLD & CO. S.F.: place--upper body.
Manufacturer: Repsold & Company, San Francisco, California.
Compare: Fike (1967:4).

4. Figure 45a-b
Special name of bottle type: Bi-metallic flask
Dates bottle in use: 1880-1913
Provenience: Structure 4

Manufacturing techniques: glass color--clear; closure--nickel-plated sheet metal screw cap: finish--threaded; body--oval; base--oval border; neck--slightly tapered cylindrical bore--cylindrical; collar--present; mold--cup-bottom; heel--rounded; shoulder--rounded
Measurements: height 15.5 cm; bore 1.5 cm; base 3.6 cm X 7.6 cm; body 4 cm X 8.2 cm; neck 2.8 cm
Markings: type--embossing; lettering--B with reversed 16; place--base
History: The maker of this company is unknown. The letter "B" is not designed like any of those listed in Toulouse (1971).
Compare: Blumenstein (1965:25).

5. Figure 45c-d
Special name of bottle type: Flask
Dates bottle in use: 1860-1913
Provenience: Structure 4
Manufacturing techniques: glass color--brown; closure--cork; finish--brandy; body--oval; base--oval border; neck--slightly tapered cylindrical; bore--cylindrical; mold--post bottom; heel-rounded; shoulder--rounded
Measurements: height 22.5 cm; bore 2.7 cm; base 4.2 cm X 8.4 cm; body 4.6 cm X 9.6 cm; neck 2.6 cm
Markings: type--embossing; lettering--(body) QUAKER MAID WHISKEY S.H. & CO. (base) PATENTED; place--body and base; designs--relief lines and floral pattern on shoulder
Manufacturer: S. Hirsch & Company, Kansas City, Missouri
Compare: Blumenstein (1965:164); Fike (1965:5,14)

C. Flat Whiskey
1. Figure 45e-f
Special name of bottle type: Flat Whiskey
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--cork; finish--double-ring; body--rectangular; base--rectangular border; neck--tapered cylindrical; bore--cylindrical; collar--present; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: height 14.4 cm; bore 1.7 cm; base 4 cm X 8 cm; body 4 cm X 8 cm; neck 2.8 cm
Markings: type--embossing; lettering--M in a circle; place--base
History: The "M" in a circle has been the trademark of the Maryland Glass Corporation, Baltimore, Maryland since 1916. The company was founded in 1907 and was built for the Emerson Drug Company (Toulouse 1971:339-341). This bottle may not have been manufactured by this company.

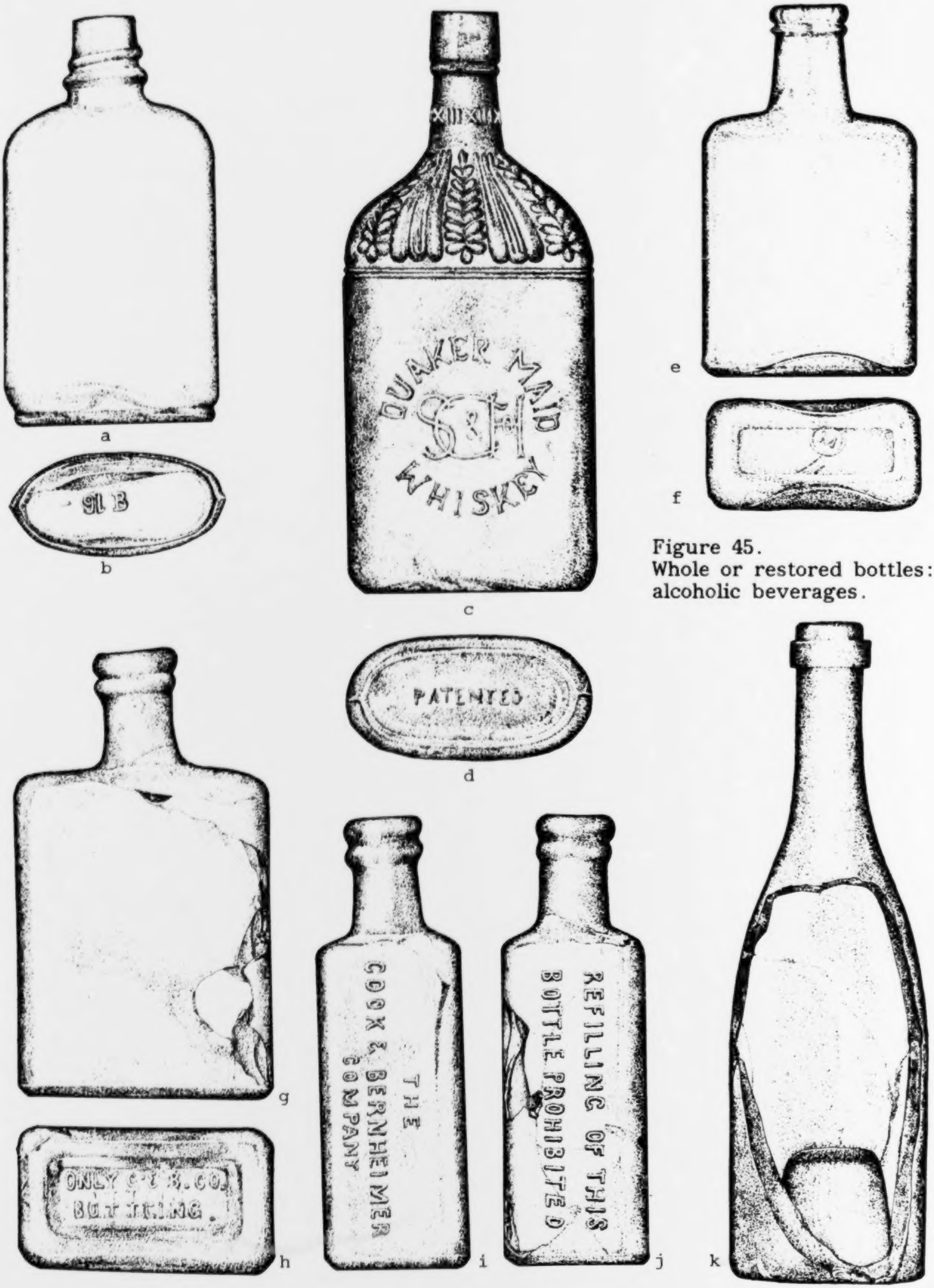

a
b
91 B
c
QUAKER MAID
S & H
WHISKEY
d
PATENTED
e
f
g
h
ONLY C & B. CO.
BOTTLING.
i
THE
COOK & BERNHEIMER
COMPANY
j
REFILLING OF THIS
BOTTLE PROHIBITED
k

Figure 45.
Whole or restored bottles: alcoholic beverages.

2. Figure 45g-j

   Special name of bottle type: Flat Whiskey

   Dates bottle in use: 1860-1913

   Provenience: Structure 4

   Manufacturing techniques: glass color--brown; closure--cork; finish--double-ring; body--rectangular; base--rectangular border; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup-bottom; heel--straight; shoulder--rounded at a right angle

   Measurements: height 17.4 cm; bore 1.8 cm; base 5.2 cm X 9.6 cm; body 5.4 cm X 9.8 cm; neck 2.8 cm

   Markings: type--embossing; lettering--(panels) REFILLING OF THIS BOTTLE PROHIBITED/ THE COOK & BERNHEIMER COMPANY (base) ONLY C & B CO. BOTTLING: place--body panels and base

   Manufacturer: The Cook and Bernheimer Company

D. Miniature Whiskey

1. Figure 46a

   Special name of bottle type: Miniature whiskey

   Dates bottle in use: 1880-1913

   Provenience: Structure 4

   Manufacturing techniques: glass color--clear; closure--cork; finish--brandy; body--cylindrical; base--round border; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup-bottom; heel--straight; shoulder--rounded

   Measurements: height 12.4 cm; bore 1.1 cm; base 3.6 cm; body 3.6 cm; neck 1.6 cm

   Markings: type--embossing; lettering--J. ILER & CO./ WILLOW SPRINGS DISTILLERY; place--body

   Manufacturer: J. Iler & Company, Omaha, Nebraska

   History: On an old label found in Fike (1965:9) reads, "Five gold and four silver medals awarded to our products at the S.M.S. & international exposition of 1898")

   Compare: Fike (1965:9 and 1967:29)

E. Champagne

1. Figure 45k

   Special name of bottle type: Champagne

   Dates bottle in use: 1880-1913

   Provenience: Structure 4

   Manufacturing techniques: glass color--olive green; closure--wired cork; finish--champagne; body--cylindrical; base--round kickup; neck--tapered cylindrical; bore--cylindrical; mold--turn mold; heel--straight; shoulder--tapered to the neck

   Measurements: height 25 cm; bore 1.8 cm; base 7 cm; body 7.4 cm; neck 2.6 cm

   Compare: Blumenstein (1966:27 and 1965:37-38)

F. Beer

a. Figure 46b
Special name of bottle type: Export Beer
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--light green; closure--cork; finish--oil; body--cylindrical; base--round border; neck--slight bulb cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: height 23.3+ cm; base 7.4 cm; body 6.4 cm; neck 3.8 cm to 2.6 cm
Compare: Blumenstein (1965:42)

2. Figure 46c-d
Special name of bottle type: Champagne Beer
Dates bottle in use: 1895-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--crown cap; finish--crown; body--cylindrical; base--round border; neck--tapered cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--tapered to neck
Measurements: height 30.5 cm; bore 1.6 cm; base 8 cm; body 8 cm; neck 3.2 cm to 2.2 cm
Markings: type--embossing; lettering--11; place--base
Compare: Blumenstein (1965:45-46)

3. Figure 46 e
Special name of bottle type: Champagne Beer
Dates bottle in use: 1895-1913
Provenience: Structure 4
Manufacturing techniques: glass color--light green; closure--crown cap; finish--crown; body--cylindrical; base--round border; neck--tapered cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--tapered to the neck
Measurements: height 29.2 cm; bore 1.8 cm; base 7.6 cm; body 7.8 cm; neck 3.2 cm to 2.2 cm
Markings: type--embossing; lettering--W F & S / MIL; place--base
Manufacturer: William Franzen and Sons, Milwaukee, Wisconsin; dates in operation--1900-1921
History: The history of this company is as follows: It began as the Chase Valley Glass Co. No. 1 (1880-1881), Bay View Works, which made bottles for all the local companies, with the base marked C.V. CO. NO 1 MIL. A second plant was known as the Chase Valley Glass Co. No. 2 (1880-1881), Milwaukee, Wisconsin, with the base marked C.V. CO. NO. 2 MIL. This company became the Wisconsin Glass Company (1881-1886). It made fruit jars, prescriptions, beer, ink and cider bottles with the base marked W.G. CO. The plant, then taken over by the Cream City Glass Co. (1888-1894), specialized in

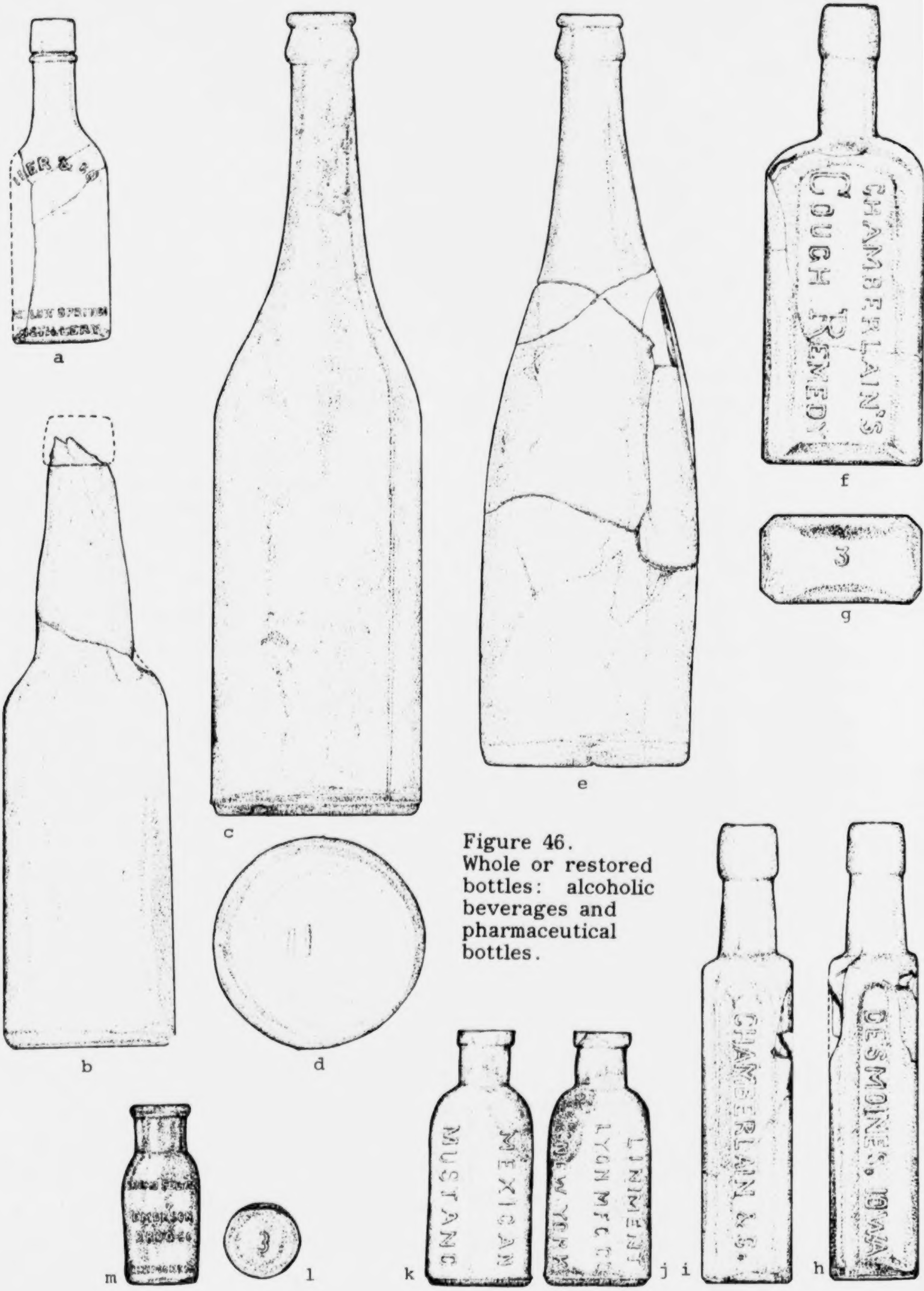

a
ER & CO
b
c
d
e
CHAMBERLAIN'S
COUGH REMEDY
f
3
g
CHAMBERLAIN & Co.
i
DES MOINES, IOWA
h
MEXICAN
MUSTANG
k
LINIMENT
LYON MFG CO
NEW YORK
j
3
l
EMERSON
DRUG CO
m

Figure 46. Whole or restored bottles: alcoholic beverages and pharmaceutical bottles.

beer bottles with the base marked C.C.G. CO. This plant then became the Northern Glass, incorporated as William Franzen and Sons (1900-1921) with the bottle bases marked W.F. & S. MIL (Noyes 1962:2-8). Prohibition caused the company to cease to exist in 1921 (Toulouse 1971:537).
Compare: Jones (1966:18 and 26)

II. Non-Alcoholic Beverage Bottles--none

III. Bitters--none

IV. Pharmaceutical and Cosmetic Bottles

A. Remedy

1. Figure 46f-i
Special name of bottle type: Patent medicine or panel
Dates bottle in use: 1880-1915
Provenience: Structure 4
Manufacturing techniques: glass color--aqua blue; closure--cork; finish--oil; body--rectangular arrow panel; base--flat ideal oval; neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded to the neck
Measurements: height 17.7 cm; bore 1.4 cm; base 3.2 cm X 6.2 cm; body 2.8 cm X 6 cm; neck 2 cm
Markings: type--embossing; lettering--(body) CHAMBERLAIN'S COUGH REMEDY / CHAMBERLAIN & CO. / DES MOINES, IOWA (base) 3; where--body panels and base
Manufactuerer: Chamberlain & Company, Des Moines, Iowa; dates in operation--c. 1879--post 1900
History: Wilson (1971: 110) refers to this company as follows:

> "Davis L. and Izanna L. Chamberlain started their company off about 1879 in Marion, Iowa with their Pain Balm and when it showed promise of being a success they moved to Des Moines a year or so later and there followed with a Cough Remedy in 1881, the Colic Cholera & Diarrhea Remedy in 1882--the formula for this contained Tinctures of capsicum, camphor and guaicum. About that time they bought Dr. Von Hoff's Curacoa Tonic Bitters. In 1883 they added St. Patric's Pills and the next year, Chamberlain's Eye & Skin Ointment. In later years they had a Cure for Consumption and the Liniment. By the turn of the century they had established their brands in every part of the country and many areas throughout the world."

Compare: Wilson and Wilson (1971:110 and 28)

2. Figure 47a-c
Special name of bottle type: Patent Medicine

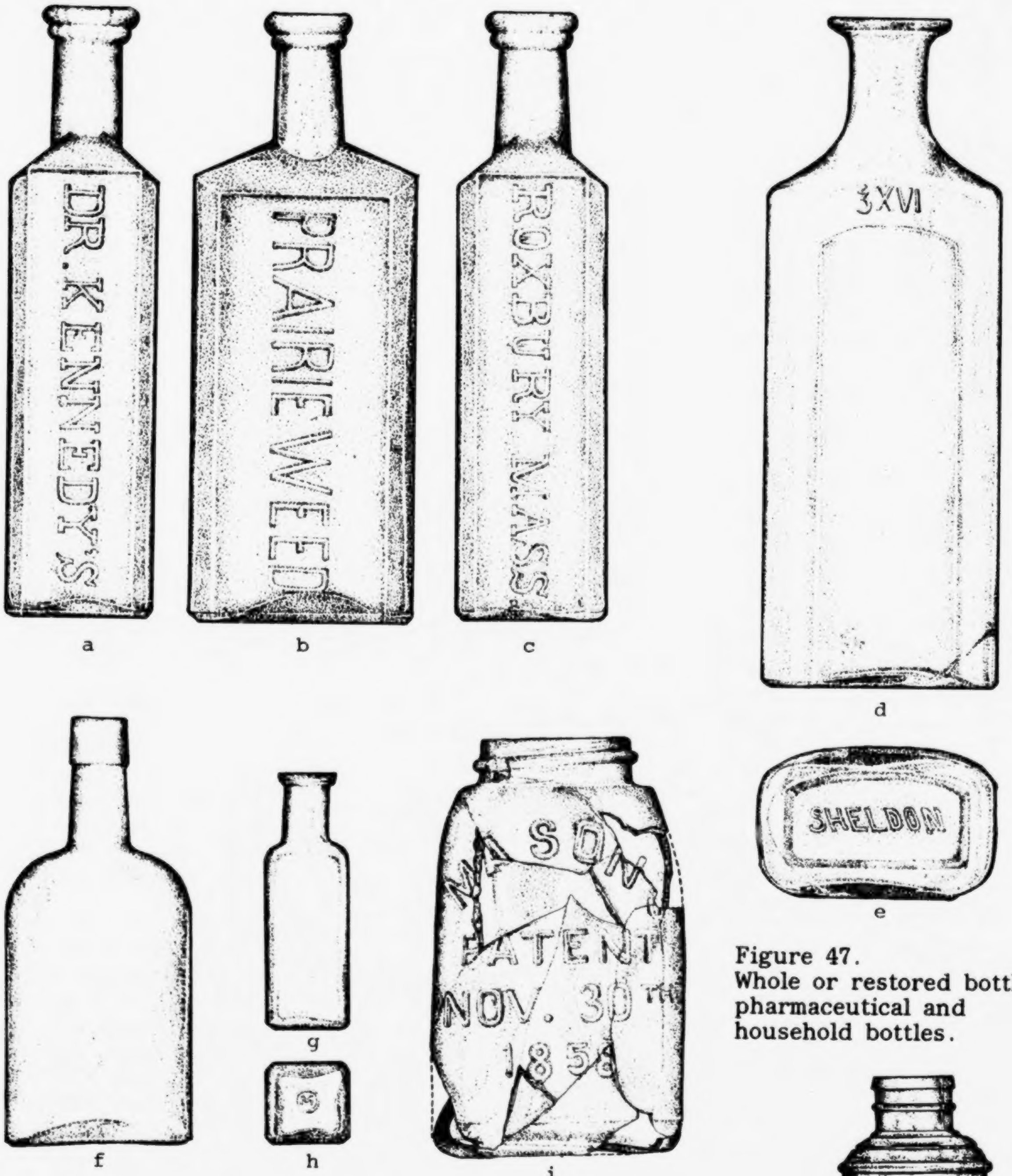

DR. KENNEDY'S
PRAIRIE WEED
ROXBURY MASS.
℥XVI
SHELDON
MASON PATENT NOV. 30TH 1858
5
CARTER'S MADE IN U.S.A.
a
b
c
d
e
f
g
h
i
j
k
l
m

Figure 47.
Whole or restored bottle
pharmaceutical and
household bottles.

Dates bottle in use: 1880-1913

Provenience: Structure 4

Manufacturing techniques: glass color--aqua blue; closure--cork; finish--double ring; body--rectangular; base--rectangular border blake--neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--obtuse angle to the neck

Measurements: height 20.8 cm; bore 1.5 cm; base 4.8 cm x 7.8 cm; body 4.8 cm. x 7.8 cm; neck 2.4 cm

Markings: type--embossing; lettering--DR. KENNEDY'S/ PRAIRIE WEED / ROXBURY, MASS.: place--body

Manufacturer: Donald Kennedy, Roxbury, Massachusetts; dates in operation--1848-post 1900

History: Regarding this company Wilson (1971:123) states,

> "Donald Kennedy of Roxbury, Mass., began preparing and bottling the medicines pictured about 1848. By the mid-1850s they were widely distributed by general agents, and he picked some of the big ones: Charles H. Ring, C.V. Clickner, A.B. & D. Sands and Story, Redington & Co. were among them. In 1874, his son George G. Kennedy opened a central distributing depot in Boston and by the turn of the century, it was one of the busiest in the U.S. The Medical Discovery was always the best seller. The Prairie Weed acted as a balsam and tonic for the cure of coughs and colds, inflammation of the throat & lungs & all difficulties tending toward consumption."

Compare: Wilson and Wilson (1971:50 and 123)

B. Liniment

1. Figure 46j-k

Special name of bottle type: Round Prescription

Dates bottle in use: 1880-1913

Provenience: Structure 4

Manufacturing techniques: glass color--light green; closure--cork; finish--patent lip; body--cylindrical; base--round border; neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded to the neck

Measurements: height 9.8 cm; bore 1.1 cm; base 3.8 cm; body 3.8 cm; neck 2 cm

Markings type--embossing; lettering--MEXICAN MUSTANG LINIMENT / LYON MFG. CO NEW YORK; place--body

Manufacturer: Lyon Manufacturing Company, New York, New York; dates in operation--c. 1860-??

History: With regard to this company Wilson (1971:127) states,

> "Shortly after the Mexican war, George W. Westbrook who was a chemist in St. Louis, Mo., began putting up the Liniment and in 1850 gave sole agency to

Addison G. Bragg & James H. McLean. That partnership broke up in 1853 and Bragg wasn't doing as well with the brand to suit Westbrook, so in 1856, he moved to N.Y. City and gave sole agency to Barnes & Park. After that, the sales boomed and Westbrook sold the brand to Barnes & Park and retired a wealthy man, about 1860. When that combine split in the early 1860s, Demas Barnes bought sole ownership from John D. Park."

Compare: Wilson and Wilson (1971:59 and 127); Fike (1965:20); Colcleaser (1966:67); Berge (1968:183).

C. Bromo-seltzer

1. Figure 461-m

Special name of bottle type: Bromo-seltzer

Dates bottle in use: 1880-1913

Provenience: Structure 4

Manufacturing techniques: glass color--cobalt blue; closure--cork; finish--extract; body--cylindrical; base--round border; neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--straight curve to the neck

Measurements: height 7 cm; bore 1.4 cm; base 2.7 cm; body 3 cm; neck 2 cm

Markings: type--embossing; lettering--/BROMO SELTZER EMERSON DRUG CO. BALTIMORE MD. (base) 3; place--body and base

Manufacturer: Emerson Drug Company, Baltimore, Maryland; dates in operation--1888-present

History: Eastin (1965:16) provides the following data regarding this company: "Cobalt Blue containers have been used excluisvely for BROMO-SELTZER, since its formulation in 1888, by Captain Emerson, in his drug store. The first plant for manufacturing BROMO-SELTZER, was built in 1891.

The original bottles were partially hand-fashioned and were supplied by Hazel-Atlas. In 1907, the Maryland Glass Coporation was established for supplying future containers for the product. This was after the Owens Automatic Procedure.

Cork closures were used until 1920, then were replaced with metal seals. The changeover was completed in 1928. The change from metal seal to screw cap was made in 1954."

Wilson (1971:107) further states, "Captain Isaac E. Emerson established himself in Baltimore as a druggist first in the early 1880s. In 1888 he built a manufactory for making his Bromo Seltzer and it was first bottled and sold about that time. The formula consisted of Potassium Bromide and caffeine. It also had an ingredient that was deadly if taken in excessive dosage--Actanilid. The formula was, of course, changed after the Food and

Drug Act."
Compare: Eastin (1965:16); Wilson and Wilson (1971:107)

D. Medicine

1. Figure 47d-e
Special name of bottle type: Prima oval prescription
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--purple; closure--cork; finish--prescription; body--rectangular; base--rectangular border; neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--concave curve to the neck
Measurements: height 22.5 cm; bore 1.5 cm base 4.8 cm x 8 cm; body 4.8 x 8 cm; neck 2.6 cm
Markings: type--embossing; lettering--(body) 3XVI (base) SHELDON; place--body and base
Manufacturer: Dr. Sheldon's Magnetic Liniment; dates in operation--c. 1870.
History: Wilson and Wilson (1969:138) state the following concerning this company: "The brand is believed to have been originated by Dr. Leonard L. Sheldon, a Boston physician of the 1870s."
Compare: Blumenstein (1963:64); Wilson and Wilson (1971:138)

2. Figure 47f
Special name of bottle type: Jamaica Ginger
Dates bottle in use: 1860-1913
Provenience: Structure 4
Manufacturig techniques: glass color--aqua blue; closure--cork; finish--oil; body--oval; base--oval border; neck--slightly tapered; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded to the neck
Measurements: height 14.4 cm; bore 1.1 cm; base 2.8 cm x 6 cm; body 2.8 cm x 6 cm; neck 2 cm
Manufactuers: Various companies made Jamaica Ginger.
Compare: Berge (1968:183); Ferraro and Ferraro (1964:46)

3. Figure 47g-h
Special name of bottle type:
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacuturing techniques: glass color--clear; closure--cork; finish--prescription; body--square; base--square border; neck--straight cylindrical; bore--cylindrical; mold--cupbottom; heel--straight; shoulder--slightly convex (rounded) to the neck
Measurements: height 8.7 cm; bore .9 cm; base 2.7 cm; body 2.7 cm; neck 1.6 cm
Markings: type--embossing; lettering--M inside a circle; place--base
History: See the description for Figure 45 e-f.

V. Household Bottles

A. Fruit Jars

1. Figure 47i-j

Special name of bottle type: Mason Jar

Dates bottle in use: 1860-1913

Provenience: Structure 4

Manufacturing techniques: glass color--light green; closure--screw cap; finish--threaded seal with ground top; body--cylindrical; shoulder--flat

Measurements: height 13.8 cm; bore 4.2 cm; base 7.4 cm; body 8 cm

Markings: type--embossing; lettering--(body) MASON'S PATENT NOV. 30TH 1858 (base) 5; place--body and base

Manufacturer: Various companies made Mason jars.

History: The Ball Brothers Company issues the following information concerning their bottles:

FACTS ABOUT HOME CANNING JARS

1. Ball Brothers did not manufacture their first fruit jars until 1895. In 1888 a fire destroyed their Buffalo plant and they moved their operation to Muncie. The first fruit jars were produced in Muncie in 1888.
2. The earliest jars produced did not carry the Ball name but carried only the words "Mason's Patent, Nov. 30, 1858." The jars produced by many other firms also carried those same words.
3. When the Ball name was first blown into the jars, it appeared in Gothic type letters. We don't know when this practice was started, but it was discontinued in 1892 or 1893. From that time on the Ball name appeared in script form. The nature of the script signature has changed several times, and it can give us some clue to the age of a given container.
4. The date of the Mason patent was eliminated from the jars sometime around 1904. No accurate information is available on this change.
5. The trade names, Standard, Eclipse, Special, Sure Seal, Ideal, Perfect Mason, Quick Seal (made for Woolworth stores), Safe Seal (made for Kresge stores), Drey, Banner and Climax (last two made for Fisher-Bruce of Philadelphia) were used on Ball made jars at one time or another. Ball freezer jars were introduced in 1946.
6. Sure Seal jars were manufactured from 1908 until 1922.
7. The Ideal jar was introduced during World War I - we can't be exactly sure of the date - and was discontinued in 1962.
8. Most of the jars bearing the Eclipse name were a wide mouth version of the Sure Seal and Ideal

types. However, a few Eclipse jars were made with a mouth the same dimensions as the Ideal jar.

9. The word Perfect was blown into the side wall of Ball Mason jars starting around 1915.

10. Ball jars having a shouldered groove which were sealed with a tin lid and wax were called our STANDARD line. There is no information available as to when these jars were first produced, but production was discontinued in 1912.

11. The Ball Perfect Mason with the small vertical side ribs were produced during the middle 1930's.

12. Ball stopped manufacturing green glass jars in 1937. However, clera (flint) jars were manufactured before that date.

13. The numbers you find on the bottom of home canning jars identify the mold set from which the particular jar was made.

14. In 1889 Ball patented and started to use a semi-automatic glass blowing machine known as the "F. C. Ball Machine." This was one of the first semi-automatic machines to go into operation in this country and it gradually replaced the glass blower who worked with individual hand-held molds. The first fully automatic glass machines came into use in the early 1900's.

Further data regarding fruit jars are provided by Ellsberg (nd) as outlined here:

1832 John Landis Mason born in Millville, New Jersey.

1858 First Mason jar patented. On November 30th, his "Improved Jar" was patented. This date is found on glass jars until after 1900.

1861 Whitall Tatum Company, New Jersey, began making glass containers in 1836. It made jars for Mason marked "WHITALL'S PATENT, JUNE 18TH, 1861."

1864 Clyde Glass Works, Clyde, New York, began making jars in 1864 and continued to 1915. Its jars were for the Consolidated Fruit Jar Company, New Brunswick, New Jersey. Later they bought all of Mason's patents.

1860s and 1970s Keystone and Union mason jars were made.

1884 A. G. Smalley & Company, Boston, Mass., made the Smalley Fruit Jar, patented September 23, 1884. Jars of this company bear the inscription "MASON'S PATENT NOV. 30TH 1858" and "MASON'S IMPROVED."

1885 Ball Brothers made their first fruit jar.

1901 Chapman J. Root, Terre Haute, Indiana, made the Root Mason.

1925 Latchford Glass Company made the Mission Jar up to 1938. These jars have a bell on the side and the inscription "MADE IN CALIFORNIA."

For further information on these companies, see Toulouse (1971).

2. Figure 48a-b
Special name of bottle type: Squat Columbia Perserve
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--purple; closure--seal type (possibly glass); finish--seal type; body--cylindrical; base--round border; neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: height 17.5 cm; bore 6.8 cm; base 9 cm; body 9.4 cm; neck 7.6 cm
Markings: type--embossing; lettering--(body) ECONOMY TRADEMARK (base) KERR GLASS MFG CO PORTLAND, ORE.; place--body and base
Manufacturer: Kerr Glass Manufacturing Company, Portland, Oregon; dates in operation - 1904-1909
History: Toulouse (1971:306) provides the following dates for the Kerr Glass Manufacturing Company: 1904-1909 Portland, Oregon; 1909-1912 Chicago, Illinois (sales); 1909-1912 Altoona, Kansas (manufacturing); 1912-1946 Sand Springs, Oklahoma (sales and manufacturing); since 1946 Los Angeles, California (sales); 1933 Huntington, West Virginia (manufacturing); 1943 Santa Ana, California (manufacturing); 1964 acquired the former Hazel-Atlas Plant, Plainfield, Illinois, and 1968 three plants of Armstrong Cork Company, Dunkirk, Indiana; Millville, New Jersey; and Waxahochie, Texas, were added.

The "Economy" jar was a hermetically sealed bottle made by the Illinois Pacific Glass Compnay, made between 1909 and the mid 1950s.
Compare: Blumenstein (1965:157); Toulouse (1971: 306-308)

B. Ink Bottles

1. Figure 47k-l
Special name bottle type: Cylinder Ink
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--cork; finish--packer; body--cylindrical; base--round border; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup-bottom; heel--straight; shoulder--rounded

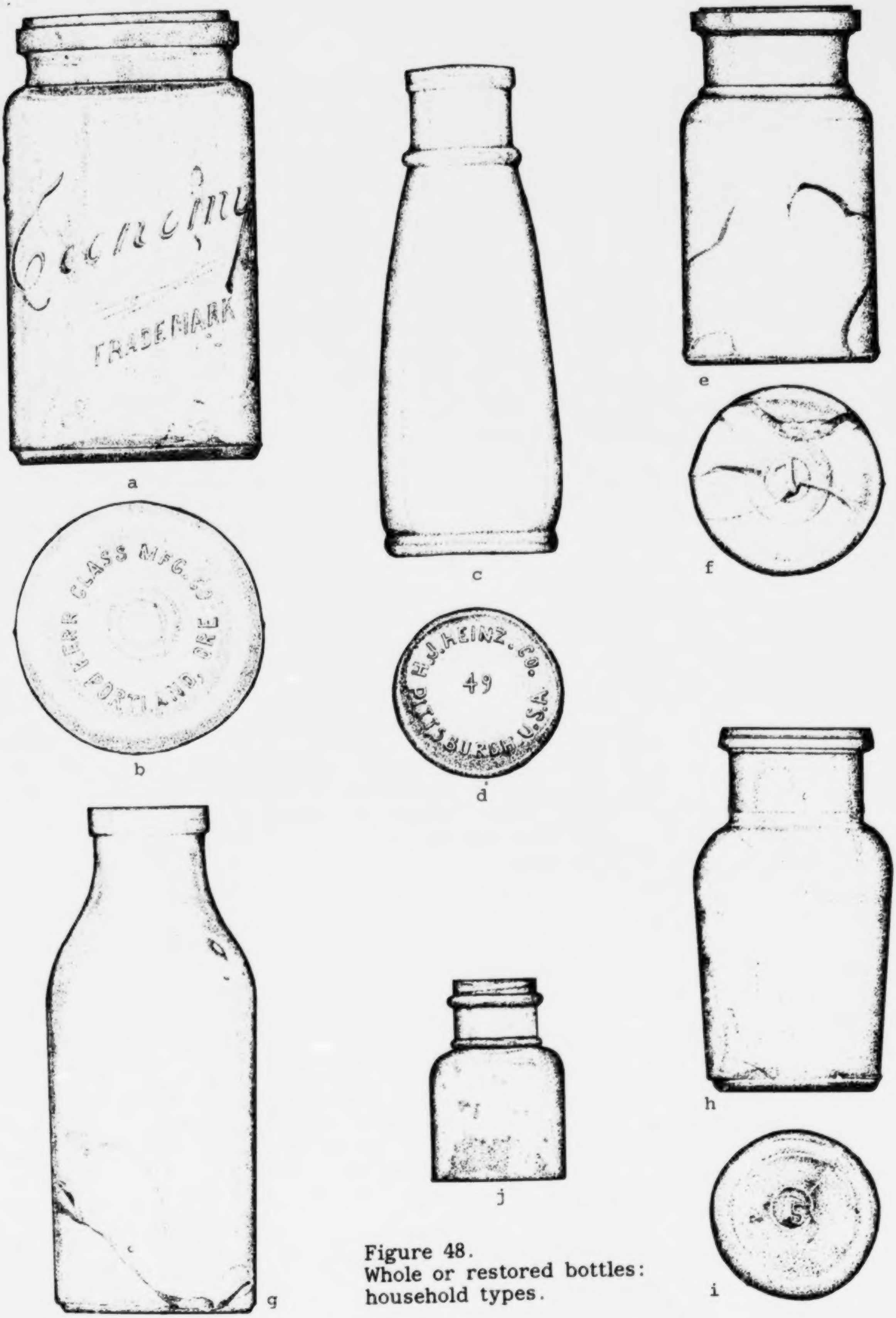

Economy
TRADEMARK
a
KERR GLASS MFG. CO PORTLAND, ORE
b
c
H.J.HEINZ.CO.
49
PITTSBURGH U.S.A.
d
e
f
g
h
i
j

Figure 48.
Whole or restored bottles:
household types.

Measurements: height 6.7 cm; bore 1.8 cm; base 4.8 cm; body 4.8 cm; neck 2.6 cm

Markings: type - embossing; lettering - CARTER'S MADE IN U.S.A.; place - base; designs - relief ring at heel and shoulder

Manufacturer: Carter Ink Company; dates in operation - 1858 - present

History: William Carter began the business in 1858. His exploits are described by Eastin (1965:47-51) as follows:

"Wishing to expand further with products relative to the business, he developed the first Combined Writing and Copying Ink in that part of the country. In the pre-typewriter era, letters were written by hand with copying ink and before mailing, an impression was made on the tissue page of a record book with the use of a letter press and moist cloth. The copying inks were heavy and inclined to offset, so for bookkeeping and important records, another ink was needed. William Carter's new Combined Ink made the second ink unneccessary.

During the first year, twenty thousand bottles of Carter's Ink and Mucilage were sold. Realizing the need to spread out, Mr. Carter hired his first salesman, J. P. Dismore, in 1863. Due to Mr. Dinsmore's active participation on behalf of the company's interest, by 1864, Carter's Inks and Mucilage has acquired national importance. Prior to this time, they had been distributed chiefly throughout New England.

During the next eight years, William's brothers, Edward and John and his cousin, John Wilkins Carter, were admitted as partners and the company name was changed each time accordingly; (from William Carter to William Carter & Bro. to William Carter & Bros. to Carter Bros. & Co.) The paper and ink products were separated in 1868, with cousin John taking over the management of the ink and mucilage division until his death in 1895.

After the Boston fire in 1872, which swept away everything except trade-marks, formulas and goodwill, the Carter Brothers sold their share to cousin John, and Mr. Dinsmore. (Company name then became Carter, Dinsmore & Co.)

With the arrival of the typewriter, the company's foresight paid off. When it looked like this strange machine was here to stay, they began laboratory development work and by '93, had a line of ribbons and carbon ready for the market. At that time making carbon paper was a tedious task. They were made by hand, the coating being applied with a brush, on paper laid over a heated marbel slab. They were then evened off by drawing a fabric covered bar over the surface. Eventually, machines were invented for making this product and Carter's were among the first to take advantage.

In 1901, the company was incorporated under the familar name, "The Carter's Ink Company," and has since become one of the world's largest industries of research as well as products."

Compare: Eastin (1965: 47-51); Ferraro and Ferraro (1964:5)

2. Figure 47m
   Special name of bottle type: Cone Ink
   Dates bottle in use: 1880-1913
   Provenience: Structure 4
   Manufacturing techniques: glass color--aqua blue; closure--cork; finish--extract; body--conial; base--round border; neck--slightly tapered cylindrical; bore--cylindrical; mold--cup-bottom; heel--rounded; shoulder--a rounded circular ring
   Measurements: height 6.7 cm; bore 1.5 cm; base .5 cm; body 6.2 cm to 3.4 cm; neck 2.4 cm
   Compare: Covill (1971:36)

C. Preserve Bottles

1. Figure 48c-d
   Special name bottle type: Obelisk Olive
   Dates bottle in use: 1880-1913
   Provenience: Structure 4
   Manufacturing technique: glass color--clear; closure--cork; finish--patent lip; body--tapering cylindrical; base--round border; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup-bottom, heel--molded groove to form a ring; shoulder--tapered to the neck
   Measurements: height 18.5 cm; bore 3.1 cm; base 6.4 cm; body 6.4 cm to 4.2 cm; neck 3.9 cm
   Markings: type--embossing; lettering--H. J. HEINZ CO. PITTSBURGH, U.S.A.: Place--base; design--glass ring on the shoulder and heel
   Manufacturer: H. J. Heinz Company, Pittsburgh, Pennsylvania; dates in operation--1860 present
   History: Henry J. Heinz was the founder of the H. J. Heinz Company. In 1869 he formed a partnership with L. C. Noble, marketing horseradish. In 1872 Heinz & Noble added Celery Sauce and Pickles, and E. J. Noble was added to the firm's partnership. The name of the company changed to Heinz, Noble & Co., and more products were added.

   The financial panic of 1875 caused the company to go broke, and Henry J. Heinz filed for bankruptcy. In 1876 he set up a new company, F. & J. Heinz. In 1888 the company name became H. J. Heinz Company.

According to the Bottle News (1974:26-27) Heinz bottles that have been embossed can be identified as follows: H. J. HEINZ 1860-1869; HEINZ & NOBLE 1869-1872; HEINZ, NOBLE & CO. 1872-1875; F. & J. HEINZ 1876-1888; H. J. HEINZ CO. 1888-??

2. Figure 48e-f
   Special name of bottle type: Plain Round Preserve
   Dates bottle in use: 1880-1913
   Provenience: Structure 4
   Manufacturing techniques: glass color--purple; closure--seal type (possibly glass); finish--seal type; body--cylindrical; base--round border; neck--straight cylindrical; bore--cylindrical; mold--shoulder-height cup-bottom with molding above the shoulders to the finish; heel--straight; shoulder--rounded
   Measurements: height 13.5 cm; bore 5 cm; base 7.2 cm; body 7.2 cm; neck 5.4 cm
   markings: type--embossing; lettering--7 in a circle; place--base

3. Figure 48g
   Special name of bottle type: Missouri Style
   Dates bottle in use: ?
   Provenience: Structure 4
   Manufacturing techniques : glass color--purple; closure--cork; finish--patent lip; body--cylindrical; base--round border; neck--tapered cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--tapers to the neck
   Measurements: height 19.6 cm; bore 3.5 cm; base 7.6 cm; body 7.8 cm; neck 4.5 cm; number of specimens--3
   Markings: type--embossing; lettering--FGW; place--base
   Manufacturer: Fairmount Glass Works, Fairmount, Indiana; dates in operation--1898-1945 (for his particular mark, 1898-1930)
   History: According to Toulouse (1972:200) the chronology of the Fairmount Glass Works is as follows: 1889-1898 Fairmount Glass Co., Fairmount, Indiana; 1898-1908 Fairmount Glass Works, Indianapolis, Indiana; 1945-1960 Fairmount Glass Works, Indianapolis, Indiana; 1961-1964 Fairmount Glass Works, Inc., Indianapolis, Indiana; 1961-1964 Fairmount Glass Corporation, Indianapolis, Indiana; 1964-1968 Fairmount Glass Company, Indianapolis, Indiana; now GLASS CONTAINERS, INC.
   Compare: Toulouse (1971:200)

4. Figure 48h-i
Special name of bottle type: Dewey Preserve
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques : glass color--purple; closure--glass cap (seats itself on lower ring inside the finish); finish--patent lip; body--cylindrical taper; base--round border; neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--tapered to base; shoulder--rounded
Measurements: height 14.2 cm; bore 4 cm; base 6 cm; body 6.4 cm to 7.2 cm; neck 5 cm
Markings: type--embossing; lettering--5 in a circle; place--base

5. Figure 49a
Special name of bottle type: Chicago Chow
Dates bottles in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--glass cap (seats itself on lower ring inside the finish; finish--patent lip; body--cylindrical; base--slightly tapered cylindrical; bore--cylindrical; mold--cup-bottom; heel--tapered to the base; shoulder--rounded
Measurements: height 25 cm; bore 4.6 cm; base 8.2 cm; body 8.6 cm; neck 5.2 cm

D. Peppersauce bottle

1. Figure 49b-c
Special name of bottle type: Oval Ring Peppersauce
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color - aqua blue; closure - cork; finish - double ring; body - cylindrical; base - round flat; neck - straight cylindrical; bore - cylindrical; mold-cup-bottom; heel - slightly flared; shoulder - tapered to the neck
Measurements: height 21.5 cm; bore 1.4 cm; base 5 cm; body 5 cm; neck 2.4 cm
Markings: type - embossing; lettering - I G CO in a diamond; where - base; designs - concentric rings around the vessel from the base to the neck, except for a plain flat area in the middle of the body where a label could have been placed
Manufacturer: Illinois Glass Company, Alton, Illinois; dates in operation - 1873-1929 (for this trademark 1900-1916).
History: The Illinois Glass Company was founded in 1873 by William Elliot Smith and Edward Levis in Alton, Illinois. Their bottles are marked as follows: I G before 1890; I G Co c. 1880-1900; I G Co in a diamond c. 1900-1916; and, I in a diamond 1916-1919.

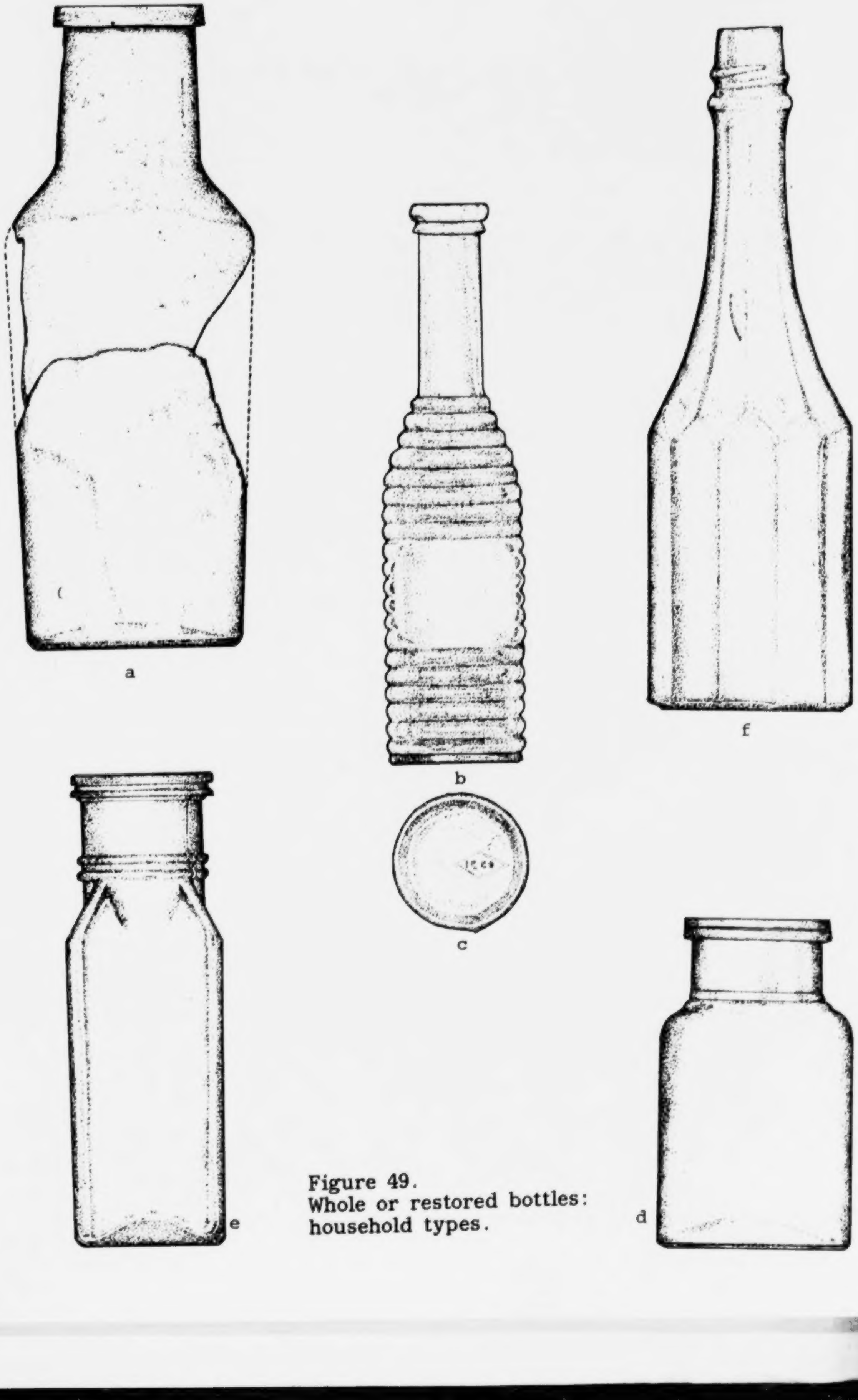


Figure 49.
Whole or restored bottles:
household types.

In 1929 the Illinois Glass Company merged with the Owens Bottle Company, forming the Owens-Illinois Glass Company (Toulouse 1971:264-268,403). Compare: Toulouse (1971:264-268)

E. Tooth Powder Bottle

1. Figure 48j
Special name bottle type: Oval Tooth Powder
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--metal screw cap (nickel plated ?); finish--threaded; body--oval; base--oval concave; neck--straight cylindrical; bore--cylindrical; collar--present; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: height 7.8 cm; bore 2.6 cm; base 7.2 cm x 3.6 cm; body 5.2 cm x 3.6 cm; neck 3.2 cm

F. Mustard bottle

1. Figure 49d
Special name bottle type: Straight Mustard
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--purple; closure--glass cap (seats itself on lower ring inside the finish); finish--patent lip; body--cylindrical; base--found border; neck--straight cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: height 12.8 cm; bore 4.4 cm; base 7 cm; body 7.2 cm; neck 5 cm

G. Pickle bottle

1. Figure 49e
Special name bottle type: Oblong Pickle
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--purple; closure--glass cap (seats itself on lower ring inside the finish); finish--patent lip; body--retangular; base--rectangular border; neck--straight cylindrical; bore--cylindrical; collar--double; mold--post-bottom; heel--straight; shoulder--obtuse angle
Measurements: height 18.2 cm; bore 3.8 cm; base 4.2 cm x 5.7 cm; body 4.2 cm x 5.7 cm; neck 4.6 cm

H. Ketchup bottle

1. Figure 49f
Special name bottle type: Decagon Catsup
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--screw cap; finish--threaded; body--10-sided; neck--tapered cylindrical; bore--cylindrical; mold--cup-botoom; heel--straight; shoulder--tapers to the neck
Measurements: height 26 cm; bore 1.6 cm; base 7.2 cm; body 7.2 cm; neck 7 cm to 2.8 cm

VI. Miscellanous Bottles - none

Identifiable Bottles

I. Alcoholic Beverage Bottles

A. Large Whiskey Bottles

1. Figure 50a
Special name bottle type: Tall Seal Brandy
Provenience: Structure 4
Manufacturing techniques: glass color--clear; closure--cork; finish--packer; body--cylindrical; bore--cylindrical; shoulder--rounded
Measurements: height 21.5 + cm; bore 1.6 cm; body 6.8 cm; neck 3 cm
Markings: designs--crescent on the shoulder
Compare: Blumenstein (1966:25 and 1965:34)

2. Figure 50b
Special name of bottle type: Possibly a Turn Mould Cognac
Provenience: Structure 4
Manufacturing techniques: glass color--olive green.
Markings: type--embossed seal; lettering--E. PERNOD / COUVET; place--shoulder
Compare: Fike (1965:13)

3. Figure 50c-d
Special name of bottle type: Malt Whiskey
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--brown; closure--cork; finish--oil; body--cylindrical; base--round border; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded.
Measurements: bore 1.8 cm; base 7.8 cm; body 7.8 cm; neck 2.6 cm.

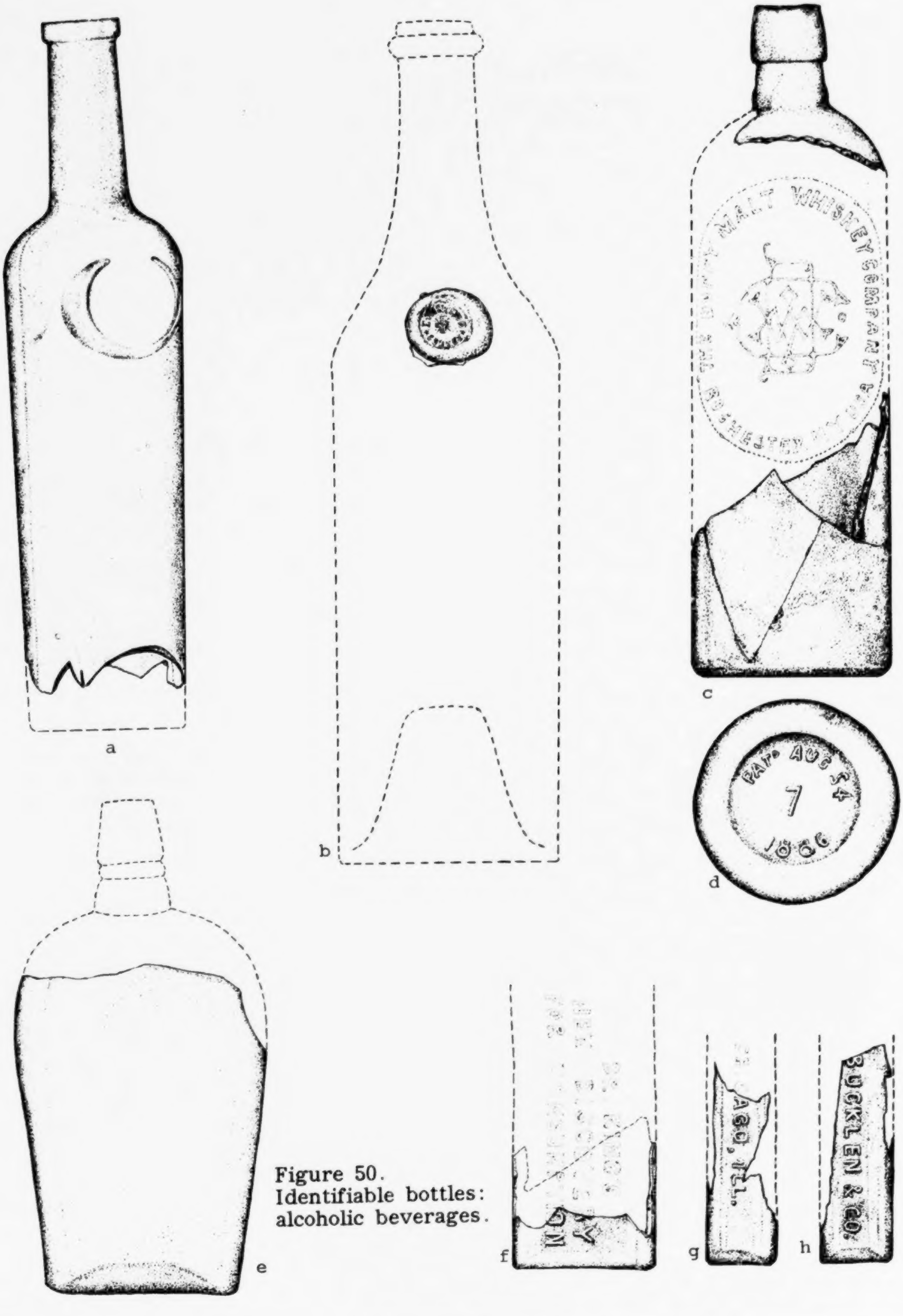

a
b
MALT WHISKEY COMPANY
ROCHESTER
c
PAT AUG
7
1866
d
e
f
AGO, ILL.
g
BUCKLEN & CO.
h

Figure 50.
Identifiable bottles:
alcoholic beverages.

Markings: type--embossing; lettering--PATD AUG 24 1886 around the number 7; where--base.
Manufacturer: Duffy Malt Whiskey Compnay, Rochester, New York; dates in operation--before 1884 to after 1900.
History: Walter P. Duffy established his business, the Duffy Malt Whiskey Company first in Baltimore, Maryland. He joined with Hubert H. Warner who eventually took over the company in 1894. Around the turn of the century the Duffy company moved to Rochester, New York (Umberger 1973:16-18).
Compare: Reed (1961:17); Blumenstein (1965:15); Umberger (1973:16-18).

B. Flasks

1. Figure 50e
Special name of bottle type: Shoo-fly flask
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; body--oval; base--oval border; mold--cup-bottom; heel--tapered; shoulder--rounded.
Measurements: base 4 cm x 7.6 cm; body 4 cm x 7.6 cm.
Compare: Blumenstein (1965:29)

2. Figure 51a-b
Special name of bottle type: Magnolia Flask
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color clear;--closure--glass stopper (seats itself on lower inside the finish); finish--brandy; body--oval; base--oval border; bore--cylindrical; collar--scalloped; mold--cup-bottom; heel--rounded.
Measurements: bore 1.8 cm; base 3 cm x 6.2 cm; body 4 cm x ??; neck 2.4 cm.
Markings: designs--scallops on the body panels.

C. Beer Bottles

1. Figure 51c
Special name of bottle type: Export Beer
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--brown; body--cylindrical; base--round border; mold--cup-bottom; heel--straight; shoulder--rounded.
Measurements: base 7.4 cm; body 7.8 cm.
Markings: designs--circular ring and indentation on the base.
Compare: Blumenstein (1966:47)

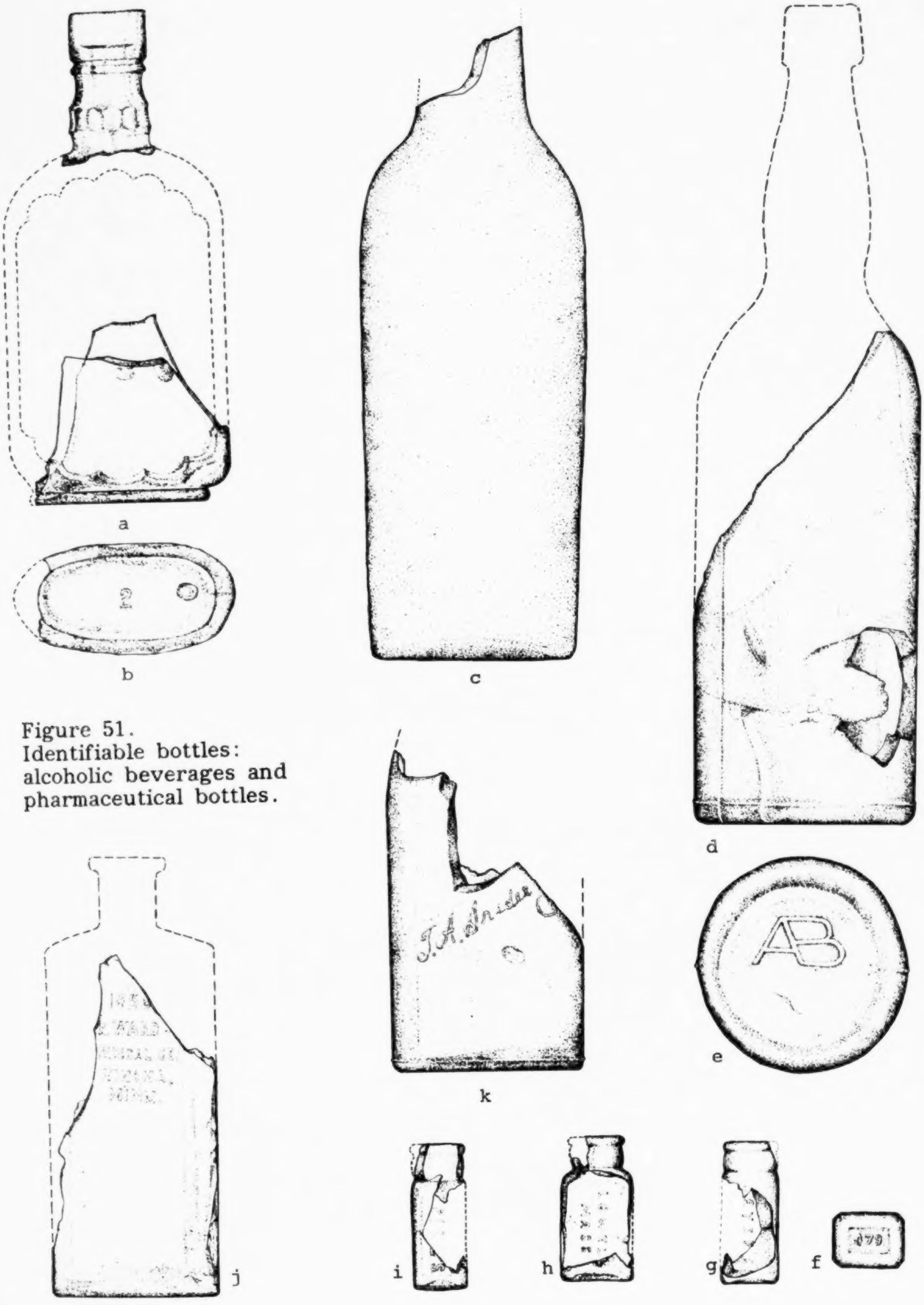

a
b
2
c
d
AB
e
T.A. Snider
k
j
i
h
g
f

Figure 51.
Identifiable bottles:
alcoholic beverages and
pharmaceutical bottles.

2. Figure 51d-e

Special name of bottle type: Export Beer
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--light green; body--cylindrical; base--round border; mold--combination of cup-bottom and post-bottom; heel--straight
Measurements: base 7.6 cm; body 7.6 cm
Markings: type--embossing; lettering--dipthong AB; place--base
Manufacturer: Aldophus Busch Glass Manufacturing Company, Belleville, Illinois (1886-1907) and St. Louis, Missouri (1904-1928); dates in operation--1886-1928

History: An interesting history is provided by Mr. Thomas J. Carroll (1967) of Anheuser-Busch, Inc., St. Louis, Missouri. In part, it reads: "We date our beginning to 1852 and our first shipments of bottled beer to 1873. One of the early Budweiser bottles was embossed on the side as follows: C. Conrad & Co's Original Budweiser, U.S. Patent No. 6376 and the letters CCCo appeared on the bottom of the bottle. This type bottle was in use from 1878 to 1883. Mr. Carl Conrad was a close friend of Mr. Adolphus Busch, one of the founders of our company and grandfather of our President, Mr. August A. Busch, Jr., who collaborated with Dr. Busch in developing the formula for Budweiser beer in 1876. Mr. Conrad obtained Registration No. 6376 for the BUDWEISER trademark in 1878 and this identification, along with the name C. Conrad & Co., was embossed on the bottles containing beer brewed by our company for the Conrad Company, which also bottled the beer. In 1891 Mr. Conrad assigned this trademark to Anheuser-Busch Brewing Assciation (our former corporate name) and since that time it has been the property of our company. In 1883 the bottles with C. Conrad & Co. embossed on them were discontinued and the name Anheuser-Busch Brewing Association was placed on the label, along with the name C. Conrad & Co. The CCCo insignia and the name C. Conrad & Co. remained on the label until around 1920.

"At the time Budweiser was first manufactured in 1876 our company had 16 other brands, which were bottled in containers manufactured by various glass manufacturing companies."

"Our own company has quite a history of glass manufacturing. In 1883 Mr. Adolphus Busch bought the Belleville Glass Company in Belleville, Illinois (across the Mississippi River from St. Louis), which company manufactured bottles for Anheuser-Busch Brewing Association and other companies. Between 1890 and 1892 he established the Adolphus Busch

Glass Manufacturing Company in St. Louis for the same purpose (with the marking A.B.G.M. Co., which marking was also used on bottles manufactured at the Belleville Glass Company). In 1893 he bought an interest in the Streator Bottle And Glass Company in Streator, Illinois, which company in 1905 became the American Bottle Company (with the marking ABCo.), and in 1916 was purchased by Owens Company (later to be known as Owens-Illinois Glass Company). We manufactured bottles until around 1910. An AB marking appeared on our bottles, as well as those manufactured for other companies.

"We used bottles with our registed trademark, the A & EAGLE molded in the side, from about 1885 to around 1905 or 1910. In 1964 we began using a bottle with a circle of A & EAGLE designs just below the neck. The A & EAGLE has been our house mark since 1872.

"According to our records, we began using amber bottles around the turn of the century but not until around 1915 was the inventory of green (or blue) tint bottles exhausted, and during the transition period both colors were used. Our first use of the crown-top bottle was around 1903 so you might check the top part of any bottles of ours you have to see what type closure was used."

Compare: Blumenstein (1966:15); Toulouse (1971: 26-27); Jones (1966, 1964 and 1963c); Ferraro and Ferraro (1964).

II. Non-Alcoholic Beverage Bottles - none

III. Bitters Bottles

A. Square Bitters Bottle

1. Figure 52a-c

Special name of bottle type: Paneled Schnapps (?)
Dates bottle in use: ?
Provenience: Structure 4
Manufacturing techniques: glass color - olive green
Markings: type--embossing; lettering--CUNDURANGO; place--body
Manufacturer: W. W. Chesley & Company, San Francisco, California; dates in operation--1872-1880
Compare: Wilson and Wilson (1971:24-25); Ferraro (1964:22-23)

B. Flask

1. Figure 52d-f

Special name of bottle type: Shoo-Fly-Flask
Dates bottle in use: 1880-1915

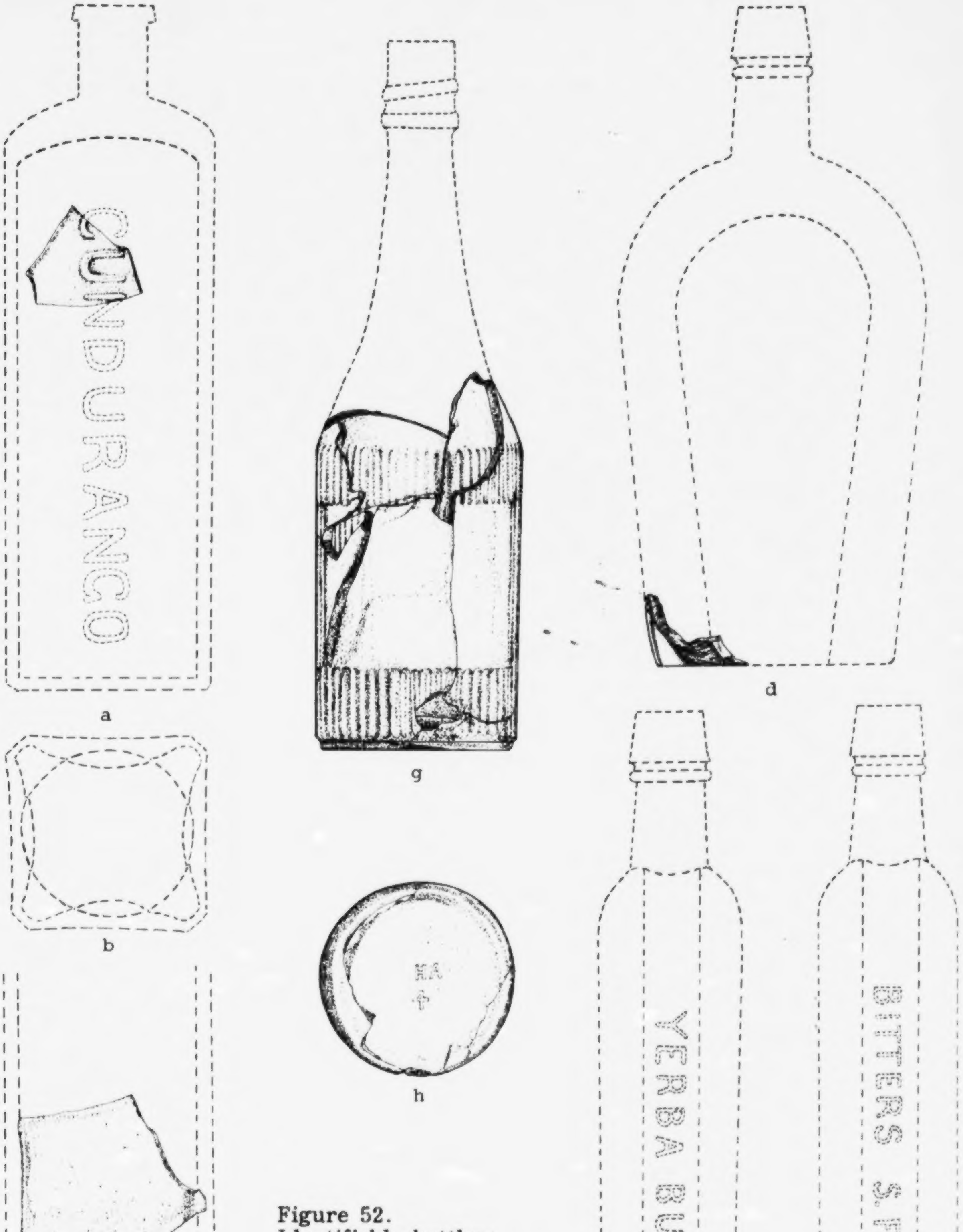

CUNDURANCO
a
b
c
g
HA
h
d
YERBA BUENA
e
BITTERS S.F. CAL
f

Figure 52.
Identifiable bottles:
alcoholic beverages and
household bottles.

Provenience: Structure 4

Manufacturing techniques: glass color - dark olive green (Black glass).

Markings: type - embossing; lettering - ....AL (probably YERBA BUENA / BITTERS S.F. CAL.); where - sides.

Manufacturer: Homer Williams and Alfred Wright, San Francisco, California; dates in operation--1820-1917.

History: Regarding this company's operation, Wilson and Wilson (1969:66) state, "Homer Williams and Alfred Wright established a vetinary and patent medicine business in San Francisco in 1869 and bought a formula from a local doctor (Warren) and began bottling it in 1870. Homer became sole owner of the bitters after a few years and when he retired in 1880 had become a wealthy man with his 'Ginger Brandy', Yerba Buena, plus other medicinal brands.

"The Paul O. Burn Wine Company of San Jose, where Homer had been supplied with the wine vehicle for his products, became owners of the 'Yerba Buena' brand in the mid 1880s and it continued to sell at a good clip until prohibition."

Compare: Wilson and Wilson (1969:65)

IV. Pharaceuticals and Cosmetic Bottles

A. Remedy bottle

1. Figure 50f-h

Special name of bottle type: Panel

Dates bottle in use: 1880-1915

Provenience: Structure 4

Manufacturing techniques: glass color--aqua blue; body--rectangular; base--rectangular border; mold--cup-bottom; heel--straight

Measurements: base 2.8 cm x 5.8 cm; body 2,8 cm x 5.8 cm

Markings: type--embossing; lettering--(body) DR. KING'S NEW DISCOVERY FOR CONSUMPTION / BUCKLEN & CO. / CHICAGO, ILL. (base) 5; place--body and base

Manufacturer: H. E. Bucklen & Company, Chicago, Illinois; dates in operation--1878-1890s+

History: The history of this medicine, according to Wilson and Wilson (1971:124), is as follows: "In 1878 Herbert E. Bucklen secured the sole rights from one Dr. Z. L. King for all of his formulas and moved from Elkhart, Indiana, to Chicago, Ill., the following year. Bucklen was one of the foremost promoters of proprietary medicines to come into the business. He expended large sums in all available media for advertising the New Discovery and by 1885 it was on its way to becoming one of the best selling brands of medicine in the world by the turn of the century. The NEW LIFE PILLS . . . were advertised as a positive cure for all stomach ailments and was introuced in 1880. That same year he began distribution of Kings Hop Cordial and Electric Bitters. In 1883 he also marketed Dr. Scheeler's Great German Cure for Consumption.

It is interesting to note that during the 1890s, some of the great scientists of the world began a campaign to educate the public about 'consumption.' It was misleading and too inclusive of many late 18th century ailments isolated by the medical profession. The campaign forced proprietary medicine owners to change to a cure of more specific ailments such as 'coughs and colds,' 'bronchial ailments,' etc."

Compare: Wilson and Wilson (1971:53); Fike (1967:11); Blumenstein (1963:33)

B. Medicine bottles

1. Figure 51f-i

Special name of bottle type: Rectangular Tablet

Dates bottle in use: 1880-1913

Provenience: Structure 4

Manufacturing techniques: glass color--aqua blue; closure--cork; finish--extract; body--rectangular; base--rectangular border; bore-cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded

Measurements: height 5.2 cm; bore 1.2 cm; base 2 cm x 2.5 cm; body 2 cm x 2.5 cm; neck 1.8 cm

Markings: type--embossing; lettering--(body) . . . LS and . . . S (base) 479; place--body and base

Manufacturer: Ayer's Pills, Lowell, Massachusetts; dates in operation--1843-present (this bottle dates to c. 1896)

History: Concerning this company Wilson and Wilson (1971:105) state, "James Cook Ayer began selling his pills locally in Lowell, Mass. where he owned a drugstore in 1843. He claimed to have first sold the Cherry Pectoral in 1843--it was actually about 1847 before it was first sold in bottles. In addition . . . the original formula contained syrup of squills, sweet spirits of nitre and spirits of bitter almonds. The pills were sold in boxes and it is most likely that it was first bottled about 1865. The Ague Cure was first bottled in 1858. The Sarsaparilla was first bottled in 1857 and the Hair Vigor first in 1867."

Compare: Fike (1967:18); Wilson and Wilson (1971:105, 18-19)

2. Figure 51j

Special name of bottle type: Panel

Dates bottle in use: 1880-1913

Provenience: Structure 4

Manufacturing techniques: glass color--clear; body--rectangular; base--rectangular border;

mold--cup-bottom; heel--straight
Measurements: base 3 cm x 6 cm; body--3 cm x 6 cm
Markings: type--embossing; lettering--1858 DR. WARD's / MEDICAL CO / WINONA, / MINN.; place--body panel
Manufacturer: Dr. Ward's Medical Company, Winona, Minnesota; dates in operation--1885 (?)--present
History: This company may have been connected with the Watkins Company. For further information see Wilson and Wilson (1971:143)
Compare: Wilson and Wilson (1971:143)

V. Household Bottles

A. Catsup bottles

1. Figure 51k
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; body--cylindrical; base circular border; mold--cup-bottom; heel--straight
Measurements: base 6.8 cm; body 6.8 cm
Markings: type--embossing; lettering--T.A. SNIDER P . . . ; place--body
Manufacturer: The T. A. Snider Preserve Company, Cincinnati, Ohio; dates in operation--1884-??
History: Toulouse (1972:449-450) lists the following chronology for this company: Mrs. Snider's, home business, Cincinnati, Ohio, late 1870s to 1884; T. A. Snider Preserve Company, Cincinnati, Ohio, 1884-??, Chicago, Illinois??, 1923: New York Canners, Albion, New York 1923-1928; Snider Packing Company, Albion, New York 1928-1943; Birdseye Division, General Foods, Albion, New York 1943-1953; Hunts Foods, Fullerton, California, since 1953.
Compare: Blumenstein (1966:40); Toulouse (1971:449) Jones (1963a:24)

2. Figure 52g-h
Dates bottle in use: 1880-1913
Provenience: Structure 4
Manufacturing techniques: glass color--clear; body--cylindrical; base--round border; mold--cup-bottom; heel--straight; shoulder--rounded
Measurements: base 7 cm; body 7 cm
Markings: type--embossing; lettering--HA / 4; place--base; designs--vertical parallel lines of raised glass around the body except for a label panel
Manufacturer: Curtice-Burns Inc., Rochester, New York; dates in operation--1867-present
History: Some history of this company may be derived from Jones (1963).
Compare: Jones (1963a:25); Blumenstein (1965:125 and 1966:40)

VI. Miscellaneous Bottles

A. Chemical bottle

1. Figure 53a-b
   Special name of bottle type: Straight Carboy
   Dates bottle in use: 1880-1913
   Provenience: Structure 4
   Manufacturing techniques: glass color--brown; closure--probably cork or a carboy stopper; finish--brandy; body--cylindrical; base--round border; neck--tapered cylindrical; bore--cylindrical; mold--cup-bottom; heel--straight; shoulder--rounded
   Measurements: bore 2.8 cm; base 20 cm; body 20 cm; neck 4.8 cm to 6.2 cm
   Compare: Blumenstein (1965:151)

Finishes

A total of 98 finishes were recovered from structures at Simpson Springs. Figure 36 illustrates the various types of "ideal" finishes for smaller bottles with a relatively narrow bore. Finishes are classified according to these general types; however, there may be variations of the earlier and hand-made types, and for those bottles whose bore is much larger, such as fruit jars or preserve wares:

1. Prescription finish (Figure 36a)

   Figure 54a

   Glass color--2 clear and 1 purple; provenience--Structure 4; use--pharmaceutical and cosmetic (medicine); description--the mold seams extend approximately 35% up the neck; no. of specimens--3

2. Wide prescription finish (Figure 36b)--none

3. Patent lip finish (Figure 36c)

   Figure 54b
   Glass color--clear; provenience--Structure 4; use--household (condiment) and miscellaneous (chemical); description--the mold seams extend approximately 35% on the neck; no. of specimens--4.

4. Packer finish (Figure 36d)

   Figure 54c
   Glass color--clear; provenience--Structure 4; use--pharmaceutical and cosmetics (tonic); description--the mold seams extend 80% up the neck; no. of specimens--2.

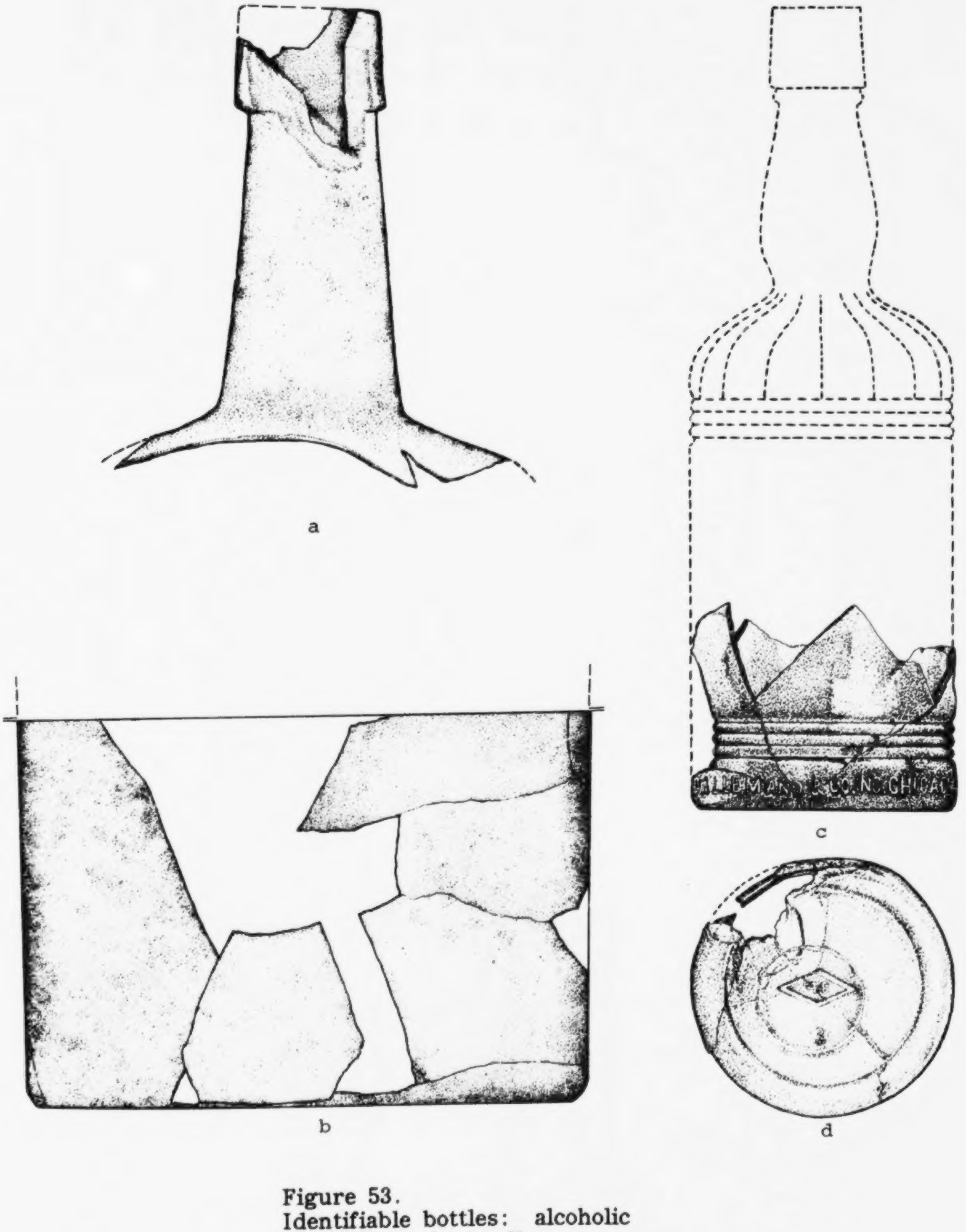

a
LLEMAN & CO. NC CHICAG
c
b
d

Figure 53.
Identifiable bottles: alcoholic beverage and miscellaneous.

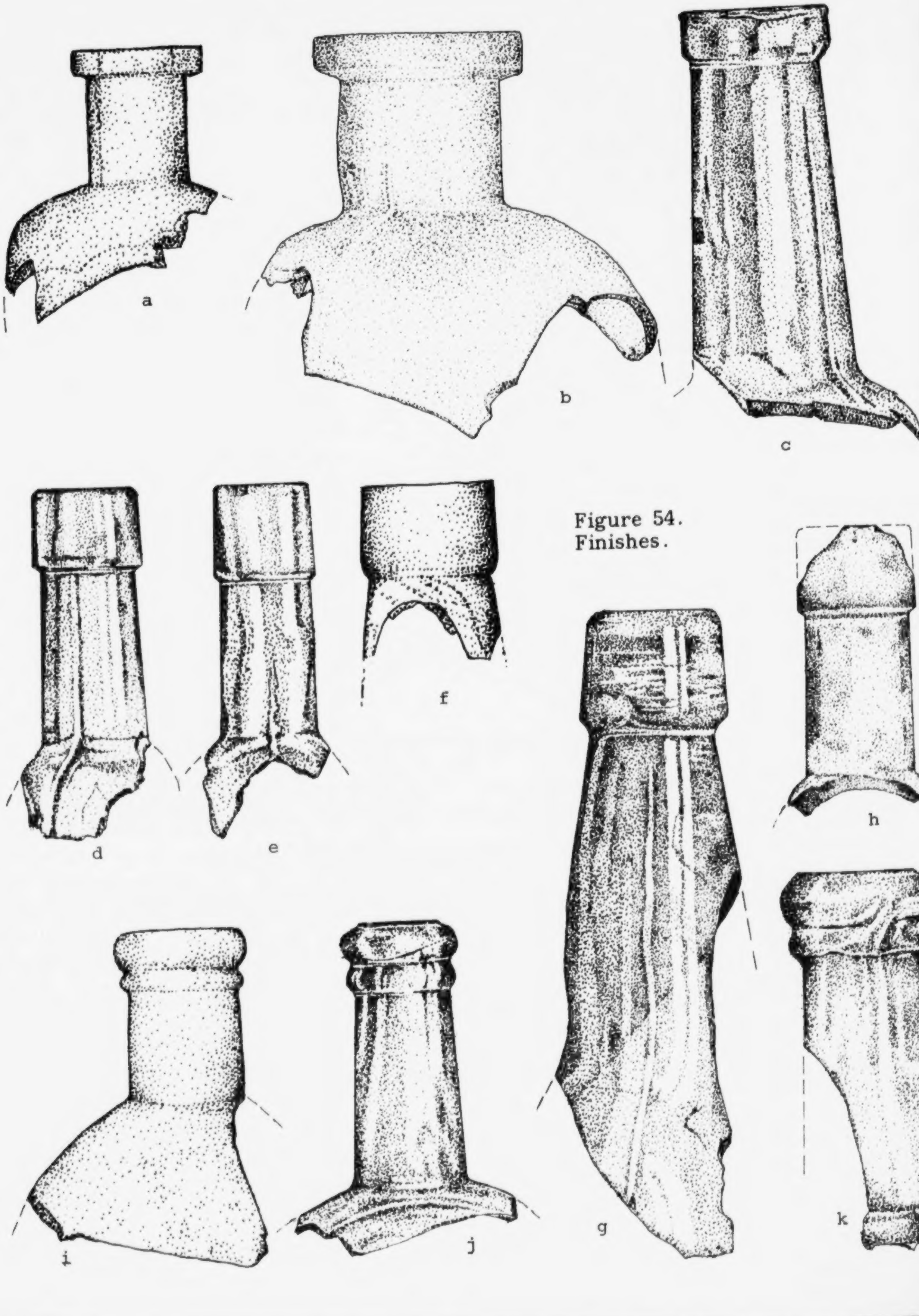

a
b
c
d
e
f
h
g
i
j
k

Figure 54.
Finishes.

5. Trumpet-mouth finish (Figure 36e)--none

6. Extract finish (Figure 36f)--none

7. Reinforced extract finish (Figure 36g)--none

8. Blow-over finish (Figure 36h)--none

9. Bead finish (Figure 36i)--none

10. Oil (ring) finish (Figure 36j)

Figure 54d-e
Glass color--clear or slightly purple; provenience--Structure 4; use--pharmaceutical and cosmetics (Jamaica Ginger); description--the mold seams extend 75% up the neck or to the bottom on the finish; no. of specimens--3

Figure 54f-g
Glass color--brown (amber); provenience--Structure 4; use--alcoholic beverage (beer); description--figure 4c has a mold seam around the top of the neck at the finish and up to the top of the finish and around the outside of the finish at the top. The other specimens have mold seams 80% up the neck with a mold-made finish that has been turned in the mold; no. of specimens--4.

Figure 54h
Glass color--aqua blue; provenience--Structure 2 (1) and Structure 4 (2); use--pharmaceutical and cosmetic (remedy); description--the mold seam extends 75% up the neck; no. of specimens--3.

11. Double ring finish (Figure 36k)

Figure 54i
Glass color--aqua blue; provenience--Structure 4; use--pharmaceutical and cosmetic (remedy); description--the mold seam extends 75% up the neck; no. of specimens--1.

Figure 54k
Glass color--aqua blue; provenience--Structure 4; use--alcoholic beverage (whiskey); description--the mold seam does not extend to the crudely-made finish; no. of specimens--1.

Figure 55a
Glass color--clear; prvenience--Structure 4; use--alcoholic beverage (whiskey); description--the mold seam extends 60% up the neck; no. of specimens--3.

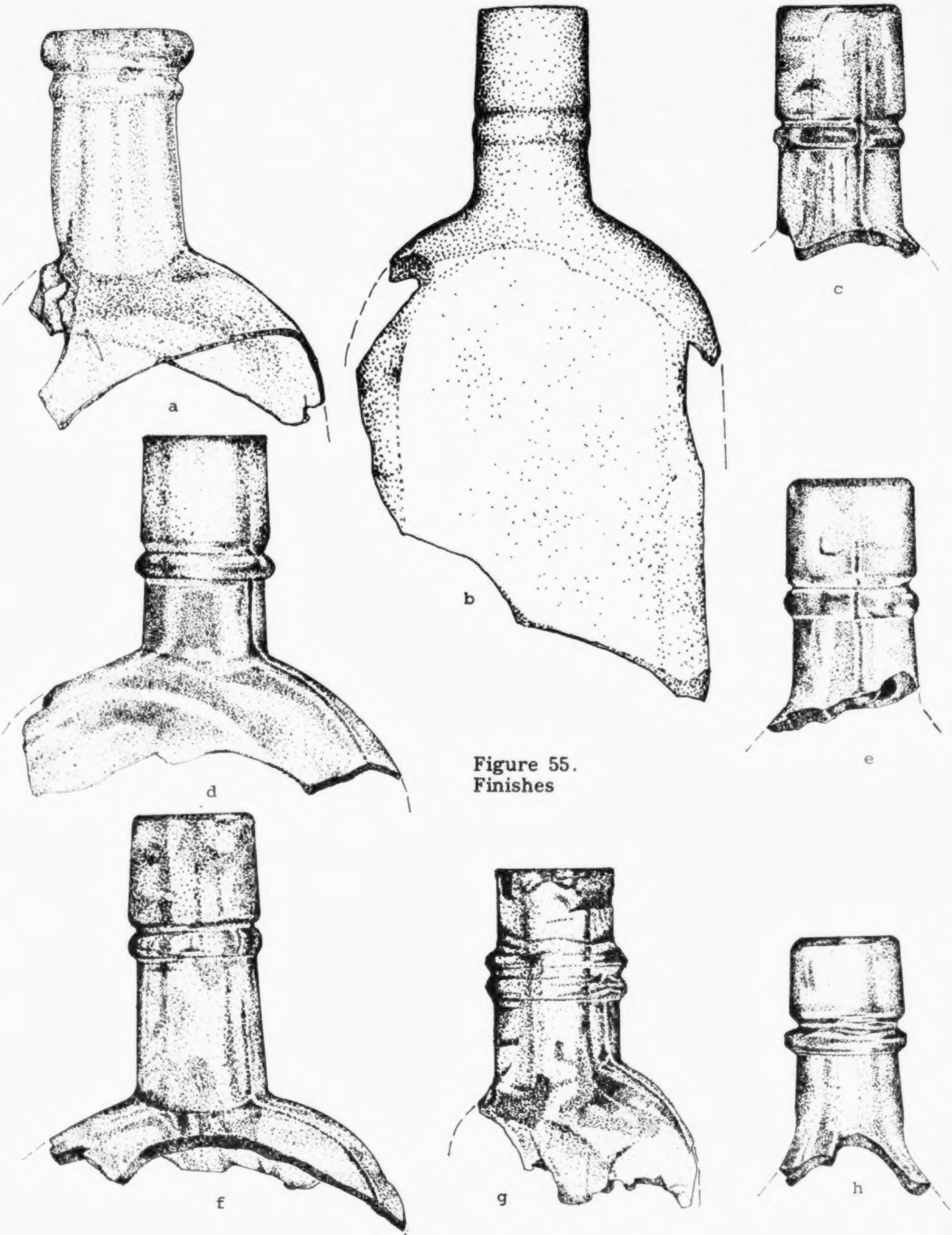


Figure 55.
Finishes

12. Brandy finish (Figure 36l)

Figure 55b-h

Glass color--purple (7), clear (15) and aqua blue (1); provenience--Structure 4; use--alcoholic beverage (whiskey flasks); description--the mold seams extend part way up the neck or at most to the finish, while on one aqua (Figure 6d) colored finish, the mold seam extends almost to the top of the finish; no. of specimens--23.

Figure 56a

Glass color--aqua blue; provenience--Structure 4; use--alcoholic beverage (beer); description--the mold seam extends half way up the bulb of the neck; no. of specimens--2.

Figure--56b-d

Glass color--purple (4), clear (2) and brown (amber) (2); provenience--Structure 4; use--alcoholic beverage (whiskey); description--the mold seams run up to the bottom of the finish; no. of specimens--8.

13. Champagne finish (Figure 36 m)

Figure 56e-g

Glass color--olive green; provenience--structure 1 (1), Structure 2 (1) and Structure 4 (4); use--alcoholic beverage (champagne or wine); description--the mold seams are not visible on any of the specimens, but three finishes are well shaped and are apparently mold-made, and two others are cruder and may not be entirely mold-made; no. of specimens--6.

14. Continuous thread finish (Figure 36n)

Figure 57a-b

Glass color--clear; provenience--Structure 4; use--alcoholic beverage (whiskey) (2) and household (ketchup) (1); description--the mold seams extend to the top of the finish; no. of specimens--3.

Figure 57c

Glass color--slightly honey color or amber; provenience--Structure 4; use--pharmaceutical and cosmetic (pill bottle); description--the mold seams extend to the top of the finish and the metal closure is still on the finish. The bottle was made by an automatic bottle machine; no. of specimens--1.

15. Flare finish (Figure 36o)--none

16. Internal Thread finish (Figure 36p)--none

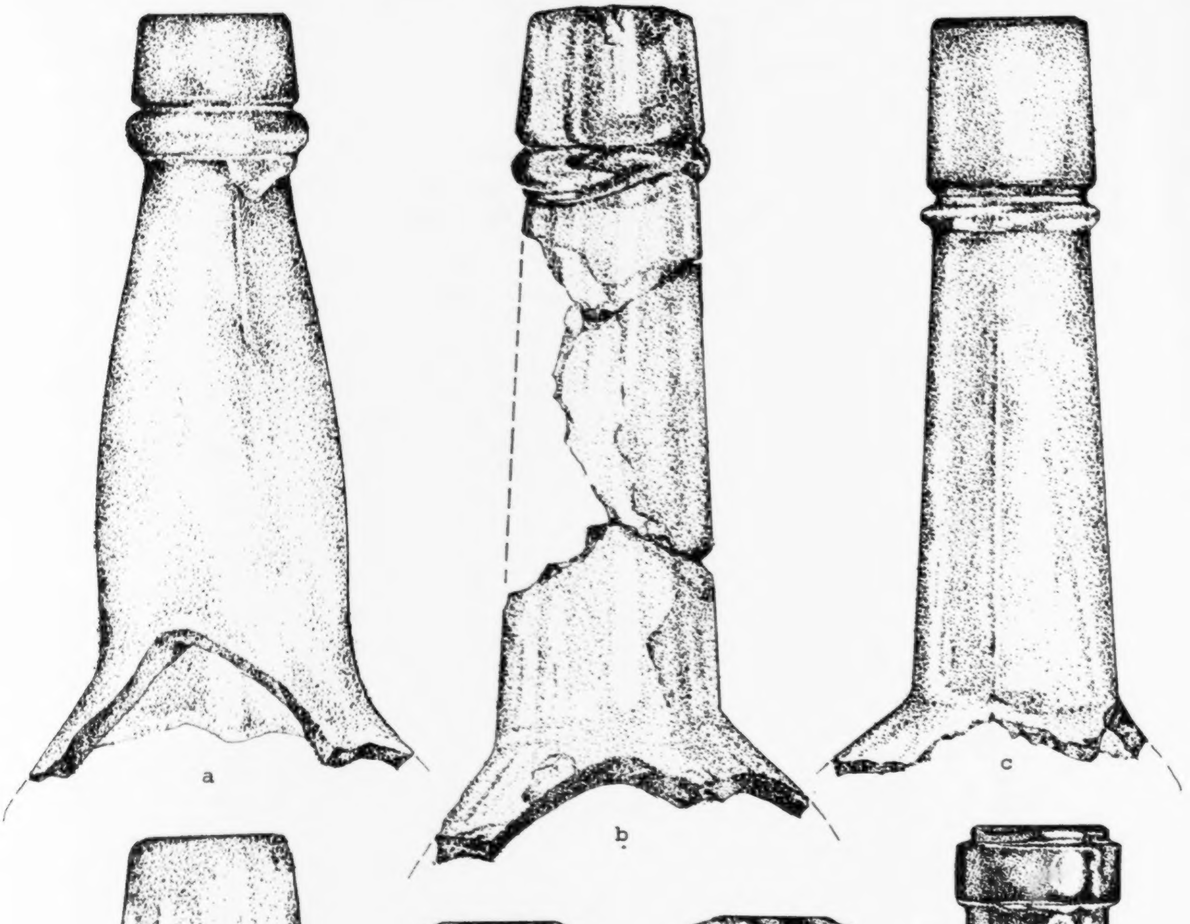


Figure 56.
Finishes.

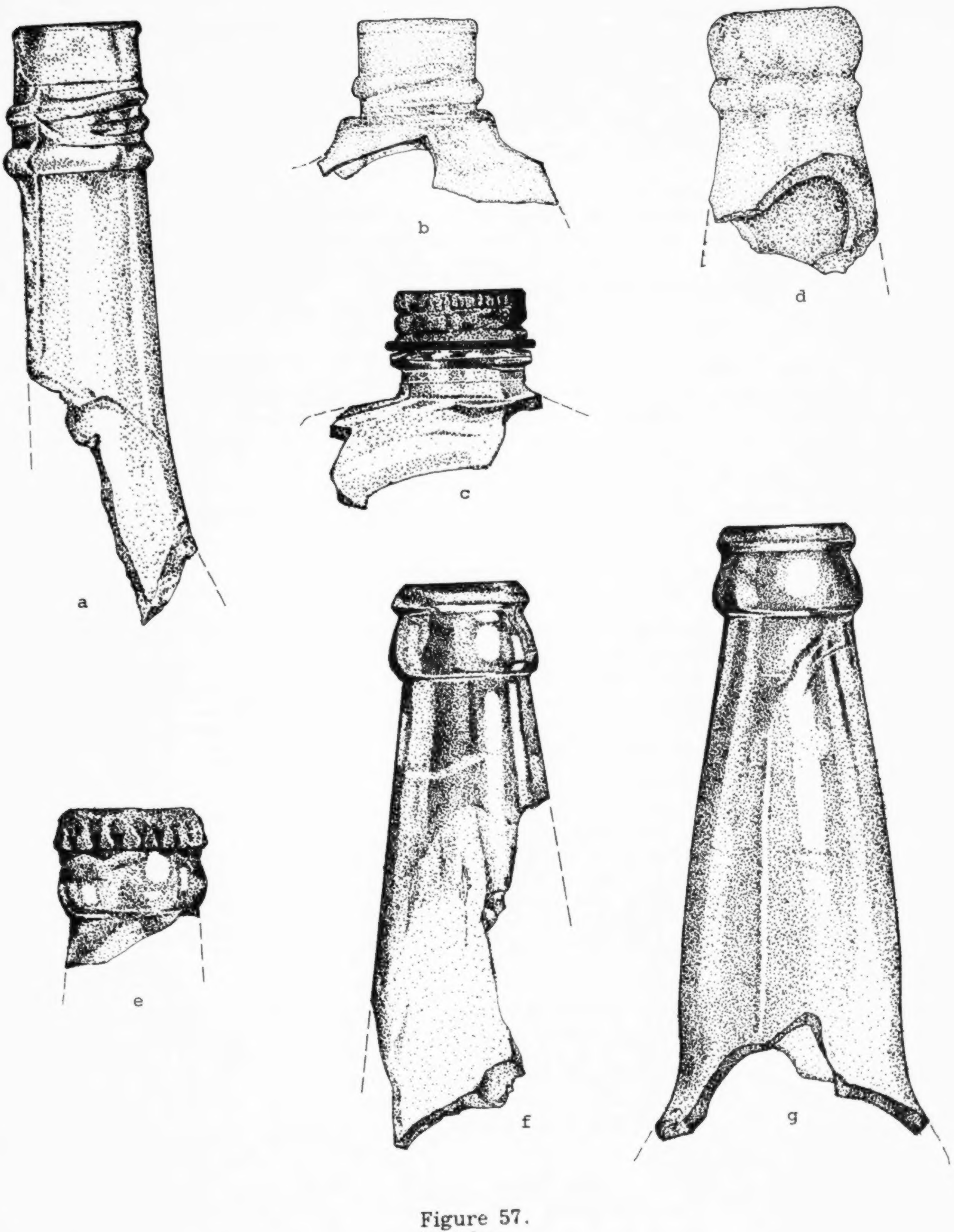


Figure 57.
Finishes

17. Spout finish (Figure 36q)--none

18. Vial finish (Figure 36r)--none

19. Soda finish (Figure 36s)

Figure 57d
Glass color--dark brown; provenience--Structure 4; use--could be beer or soda beverage bottles; description--the mold seams do not reach the finish; no. of specimens--2.

20. Crown finish (Figure 36t)

Figure 57e-g)
Glass color--clear (2), brown (2), aqua blue (1), and light green (2); provenience--Structure 4; use--probably beer or soda beverage bottles; description--the mold seams do not extend to the finish but the finish is mold-made and the brown colored specimens have striations on the finish, suggesting that they were turned in the mold; no. of specimens--7.

21. Other finishes that generally require a cap type or seal type of closure (Figures 29a-g and 33a-e)

Figure 58a
Glass color--light aqua blue; provenience--Structure 4; use--household (fruit jar); description--the mold seams extend to but not over the top of the finish, which has been ground on this threaded seal type bottle; no. of specimens--4.

Figure 58b
Glass color--very light green (1); light aqua blue (2); provenience--Structure 4; use--household (fruit jar); description--this is a threaded seal type finish with the mold seam extending to the top of the finish, and the threads are interrupted at the seam marks, while on top of the finish is a slight relief or bead of glass, probably mold-made; no. of specimens--3.

Figure 58c
Glass color--dark aqua blue; provenience--Structure 4; use--household (fruit jar); description--the mold seams extend over the top of the finish; therefore the bottle was probably made by the automatic bottle machine. The finish was capped with a zinc lid and sealed with a thread and sealing ring on the neck; no. of specimens--1.

Figure 58d
Glass color--light green; provenience--Structure 4; use--household (fruit jar); description--this finish consists of a broad glass ring like the packer finish but

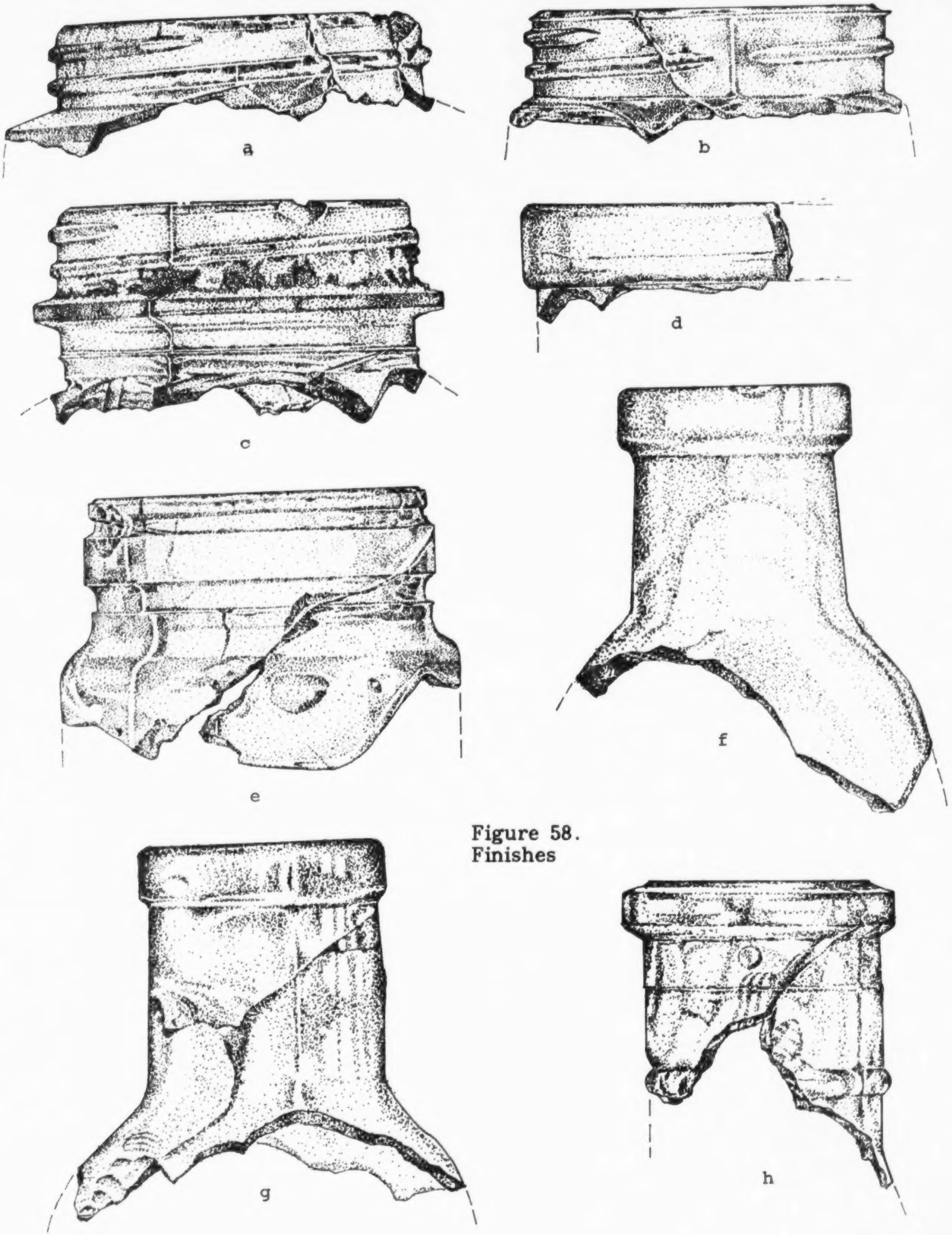


Figure 58.
Finishes

has an indented ring around the top of the finish; no. of specimens--1.

Figure 58e

Glass color--clear; provenience--Structure 4; use--household (fruit jar); description--the mold seam extends up to the finish with a slight offset; then another mold seam extends to the top of the finish. A slight glass bead or relief ring is present on the top of the finish; no. of specimens--1.

Figure 58f-g

Glass color--purple (5) clear (2); provenience--Structure 4; use--household (relish or pickles); description--this bottle has a round shoulder with the mold seam extending 80% up the neck. The finish appears to have been turned in the mold; no. of specimens--1.

Finish fragments

Glass color--dark green (1), light aqua blue (1); provenience--Structure 2; use--household (relish); description--the bead finish has been crudely applied and no mold seam is visible, but the specimens are small; no. of specimens--2.

Closures

Most closures found at Simpson Springs are those from fruit jars or fragments of lead alloy caps (Figure 59h) from whiskey bottles. In addition, a glass club sauce stopper (Figure 59g) (Putnam 1965:214) was recovered from Structure 4; two parallel-sided corks, possibly for patent medicine bottles, were unearthed--one from Structure 1 and one from Structure 4; and, several crown caps were discovered on the site surface, plus two excavated from Structure 1. Two metal sealing caps belonging to Gile's jars (Figure 59k) were found during the excavation of Structure 4.

Fruit jar closures include porcelain (actually glass) lined zinc caps for bottles with threaded seal-type finished. Three porcelain lid liners had no marks--two from Structure 4 and one from Structure 3. The other porcelain lids (3), all from Structure 4, were embossed with BOYD'S GENUINE PORCELAIN LINED (Figure 59a-d) around the perimeter, and in the center on two is a maltese cross with each wing marked with one of the following letters--M F J Co., possibly meaning the Mason Fruit Jar Company (Figure 59a-c).

Ferraro and Ferraro (1966:17) suggest that over 4,000 different types of closures were patented between 1860 and 1895, following the patenting of the Mason Jar in 1858. With reference to the Boyd cap, Lief (1965:12-13) states,

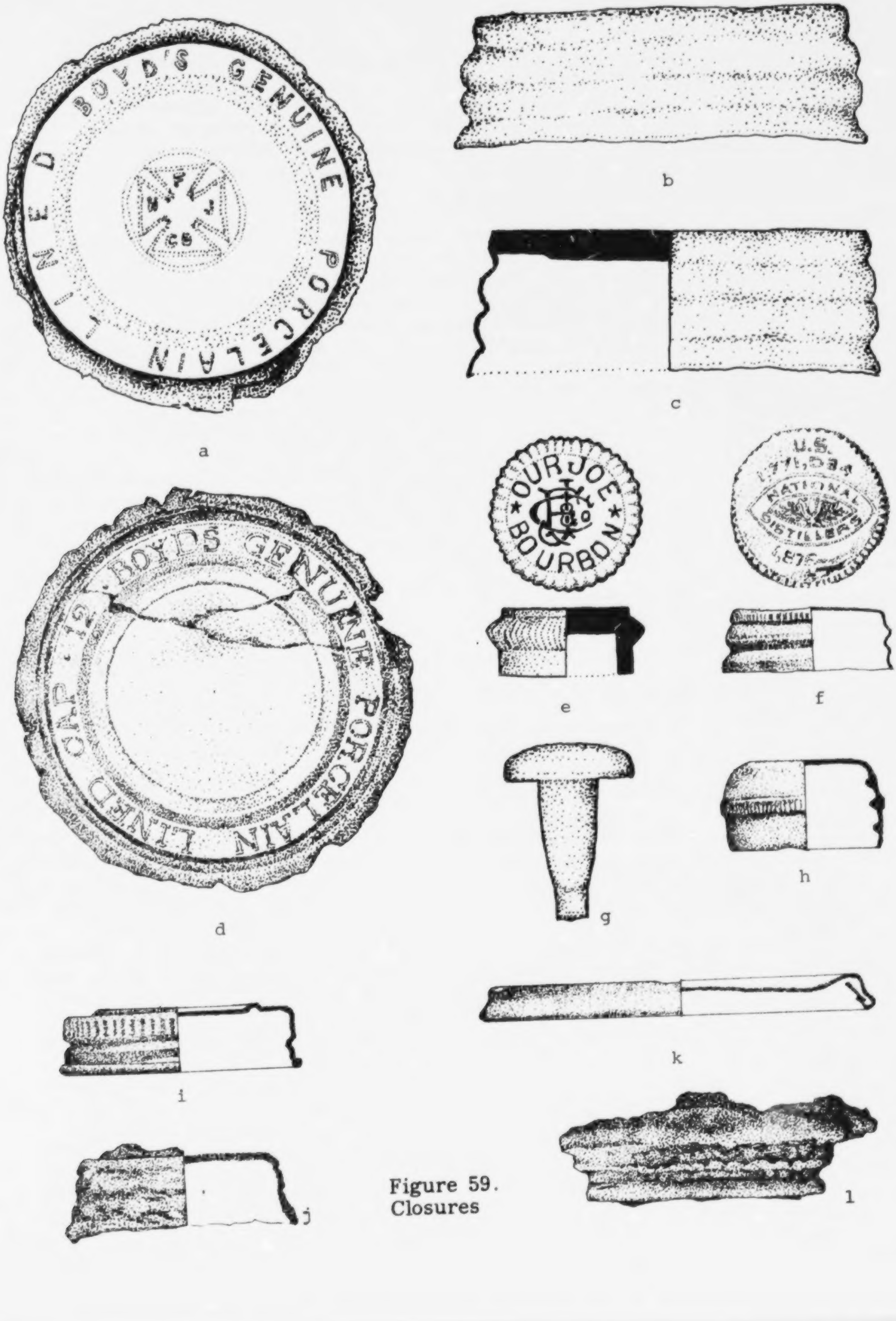

a
BOYD'S GENUINE PORCELAIN LINED
b
c
d
BOYDS GENUINE PORCELAIN LINED CAP · 12
OUR JOE
BOURBON
U.S.
NATIONAL
DISTILLERS
e
f
g
h
i
j
k
l

Figure 59.
Closures

> *glass lining in the cap to prevent contact of metal with the contents. In the alternative, he eliminated the top area of the cap and substituted the glass plate, affixed to the remaining circular screw-band. Boyd said he preferred transparent glass, believing that housewives considered visibility an advantage, but he was willing to settle for any vitreous material. Porcelain (opal glass) won out.*
>
> *The Mason jar with the Boyd cap was successful despite its limitation. Because it couldn't release internal pressure that developed with cooking in a sealed container, fruits and vegetables had to be pre-cooked. Still, a hosts of imitators entered the inviting market. Some took notice of the fact that screw caps on long-standing preserves often called for more force to open them than most women could exert. Projections were therefore soldered on caps for a wrench or key to give the start. An 1863 patent proposed, as being cheaper and more ornamental than a screw cap for a threaded jar, a shell of metal with a flat top, slightly tapering sides and a corrugated flange; somehow, it wasn't appreciated.*
>
> *Many women who bought supplies of jars and caps separately had trouble in getting them to fit. Glass houses that produced jars after Mason's patent had expired did not make them according to uniform dimensional standards. Wise were the glass manufacturers who decided to make Boyd caps to their own specifications and sold jar and cap as a unit to grateful housewives.*

Munsey (1970:146) elaborates further,

> *After several relatively unsuccessful attempts by Charles Inlay, in 1865, to develop an all-glass lid that could be closed mechanically as could Mason's zinc screw cap, Salmon B. Rowley of the Hero Company developed the first commercially successful glass lid in 1868 and 1869. Rowley's lid was actually a flat piece of glass that covered the top of the jar and was held in place by a screw cap of zinc similar to Mason's.*
>
> *Lewis R. Boyd, of New York City, saved the Mason lid in 1869 by inventing an opal glass liner (opal because it would hide any seepage and look clean). Boyd's invention was used by several other companies.*

At Simpson Springs several continuous thread (C.T.) closures were found: Figure 59f is aluminum; Figure 59h is lead alloy; and Figure 59i is tin. There was also one closure made of ceramic material for sealing a whiskey bottle (Figure 59e). Many other metal closures were so badly corroded (Figure 59j and l) they could not be identified specifically.

Bases

Fragments of bottle bases numbered 96, with most coming from Structure 4. Bases provide excellent clues to dating the bottle, since many are embossed with the manufacturer's trademark. The bottle bases described are grouped according to their use as were whole bottles.

I. Alcoholic Beverage Bottles

A. Whiskey bottles

1. Same as Figure 44a
Embossing: none
Color: clear
Type: border with the center flat
Provenience: Structure 4
Description: See Figure 44a
Dates: 1880-1913
No. of specimens: 1
Compare: Blumenstein (1965:19 and 1966:18)

2. Same as Figure 44b-c
Embossing: DESIGN PATENTED NOV. 30th 1897, and embossed with a "1" in the middle, while another is blank in the middle
Color: light purple
Type: border with a slight push-up
Provenience: Structure 1 and Structure 4
Description: The bodies of these two bottles, although fragmented, are embossed in the center of the distiller's name differently. Instead of being embossed as illustrated in Figure 44b, these read: DAYTON / ST. LOUIS / ATLANTA / ST. PAUL
History: See Figure 2.
Dates: 1897-1920
No. of Specimens: 2
Compare: Blumenstein (1965:20); Newnham (1974:34); Fike (1965:5)

3. Figure 53c-d
Embossing: 46 in a diamond, and outside the number 3
Color: brown
Type: round border with a slight push-up
Provenience: Structure 4
Description: Just below three circular bands on the heel is the embossed lettering DALLEMAND & CO. INC. CHICAGO. The mold seam is around the heel; therefore it could have been made in a cup-bottom mold.
History: Many companies utilized a diamond in their trademark. The most notable is the Diamond Glass Company, Royersford, Pennsylvania (1888 to present). For further history of users of this trademark, see Toulouse (1971:550-552).
Dates: 1880-1913
No. of specimens: 1
Compare: Blumstein (1963:18)

4. Base fragment
Embossing: This fragment has ONE QUART embossed on the heel.

Color: Light purple
Type: round border
Provenience: Structure 4
Description: This round bottle has a mold seam that runs along the base of the heel, indicating a possible cup-bottom mold.
Dates: 1880-1925
No. of specimens: 1

5. Base fragment
Embossing: unknown
Color: yellowish green or brown
Type: round border with a push-up
Provenience: Structure 4
Description: This round bottle has a mold seam around the base of the heel and a body surface that is "orange-peel" like. It is probably an early whiskey bottle (Fike, personal communication).
No. of specimens: 1

B. Flasks

1. Figure 60a-b (Shoo-fly flask like Figure 40b)
Embossing: Only two are marked: one has a 4 in the center of the base (Figure 60a), and another has an oval shape with a line through it (Figure 60b).
Color: clear
Type: slightly concave or push-up oval
Provenience: Structure 4
Description: These oval bottle bases have mold seams at the bottom of the heel and mold seams up the sides; possibly a cup-bottom mold was used. The glass in the base is thick, usually with more glass on one side than the other. For further detail see Figures 3, 6, and 50.
No. of specimens: 8

2. Figure 60c-f (Shoo-fly flask)
Embossing: All are void of marks except one, which is marked with I. G. Co. in a diamond (Figure 60c).
Color: purple
Type: slightly concave
Provenience: Structure 1 and Structure 4
Description: same as Figure 2ab above; however, a pronounced mold seam on the flask in Figure 60df is notable.
History: This trademark belongs to the Illinois Glass Company of Alton, Illinois, and was in use between 1900 and 1916. For further details on this company see the description of Figure 49b-c and Toulouse 264-268).
Dates: 1880-1915
No. of specimens: 5

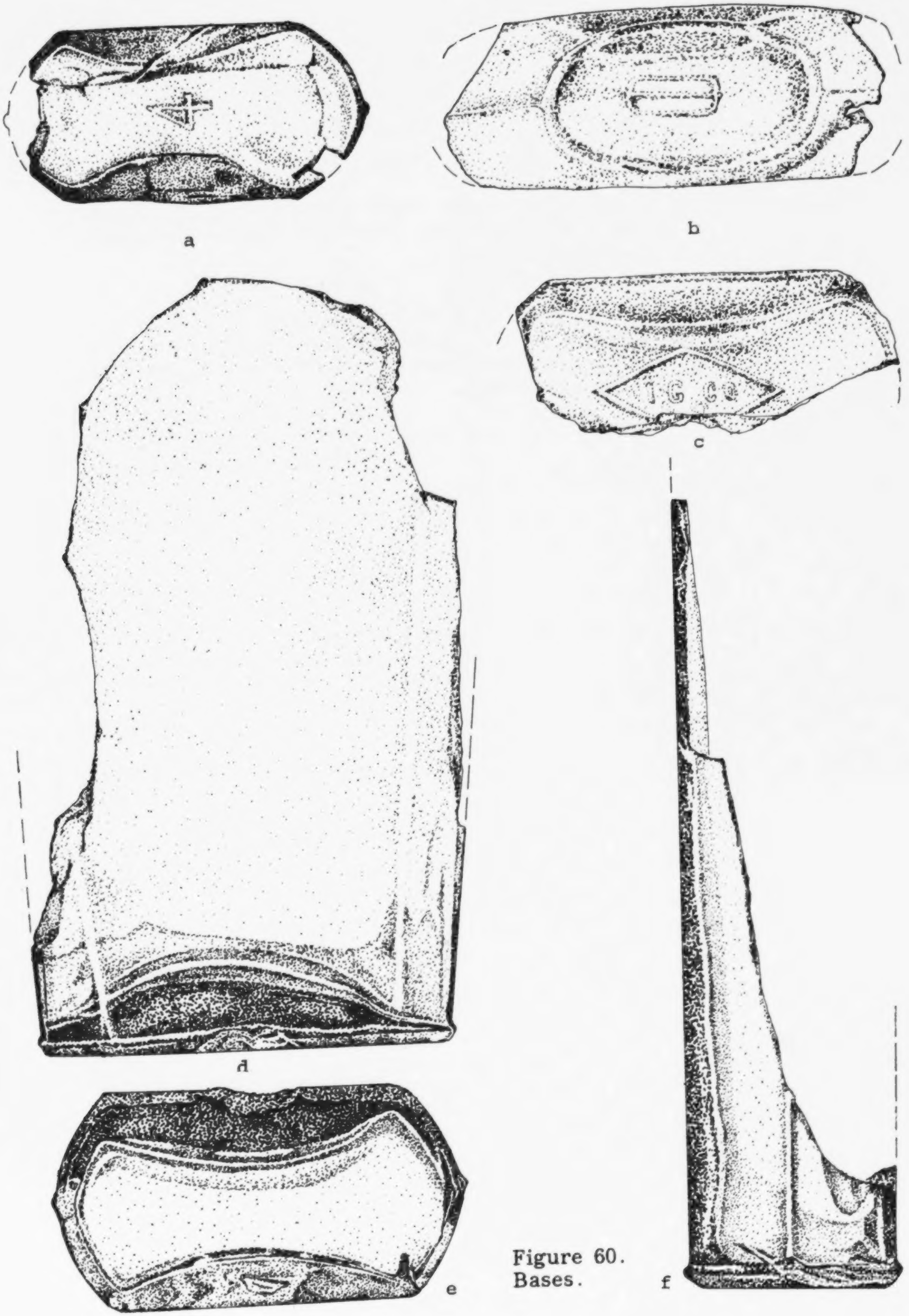

a
b
c
TG CO
d
e
f

Figure 60.
Bases.

3. Base fragment (probably a shoo-fly flask)
   Embossing: none
   Color: light green
   Type: border with a flat center
   Provenience: Structure 4
   Description: The mold seams are around the heel (cup-bottom) like the bases described above. The glass is full of air bubbles.
   No. of specimens: 1

4. Figure 61a-d (Eagle flask like Figure 41f)
   Embossing: One is marked with a backward 2 (Figure 61a), and the remainder do not have trademarks or any other embossing.
   Color: purple
   Type: Three are border type, and two are slightly concave.
   Provenience: Structure 4
   Description: The mold seams on these oval bases come down the sides and meet with a seam around the base of the heel (cup-bottom).
   Dates: 1880-1915
   No. of specimens: 5

5. Figure 62a (Picnic flask like Figure 41a)
   Embossing: Two have embossed ovals with a line through it and two are blank.
   Color: clear
   Type: slightly concave
   Provenience: Structure 4
   Description: The mold seams are like those on eagle flasks.
   No. of specimens: 4

C. Beer bottles

1. Figure 62b-c (like Figure 51d-e)
   Embossing: Both have the joined AB, but the difference in the way the letters are made, particularly the B, is notable. The brown base (Figure 62b) does not have a joined B, and under it is embossed B2. The aqua blue base (Figure 62c) has C6 under the AB.
   Color: brown (1) and aqua blue (1)
   Type: border with a flat center
   Description: The mold seams end at the bottom of the heel of this round base (cup-bottom).
   History: See description of Figure 51.
   Dates: 1880-1913
   No. of specimens: 2
   Compare: Blumenstein (1966:15); Jones (1966, 1964, and 1963c); Ferraro and Ferraro (1964); Toulouse (1971: 26-27).

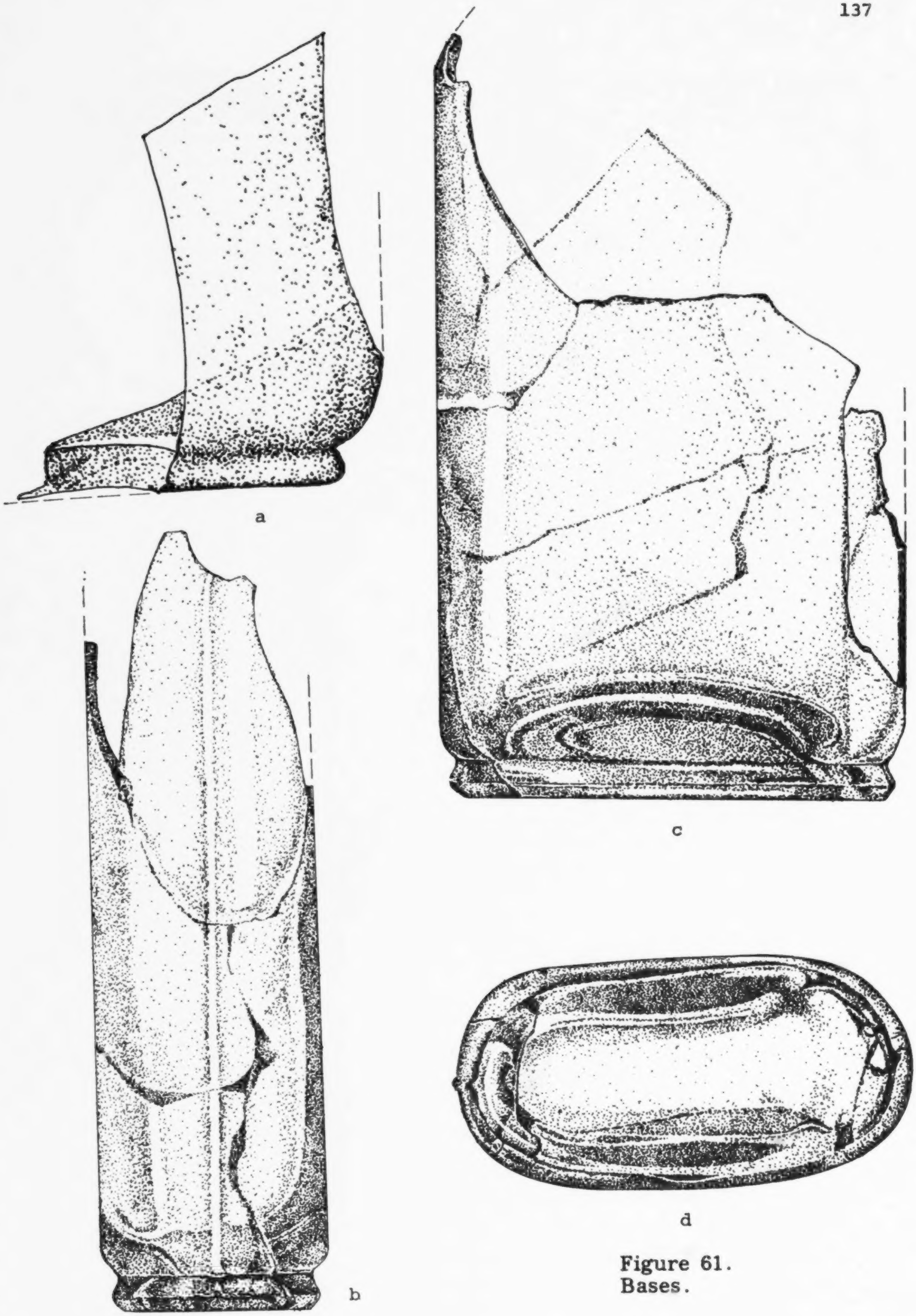


Figure 61.
Bases.

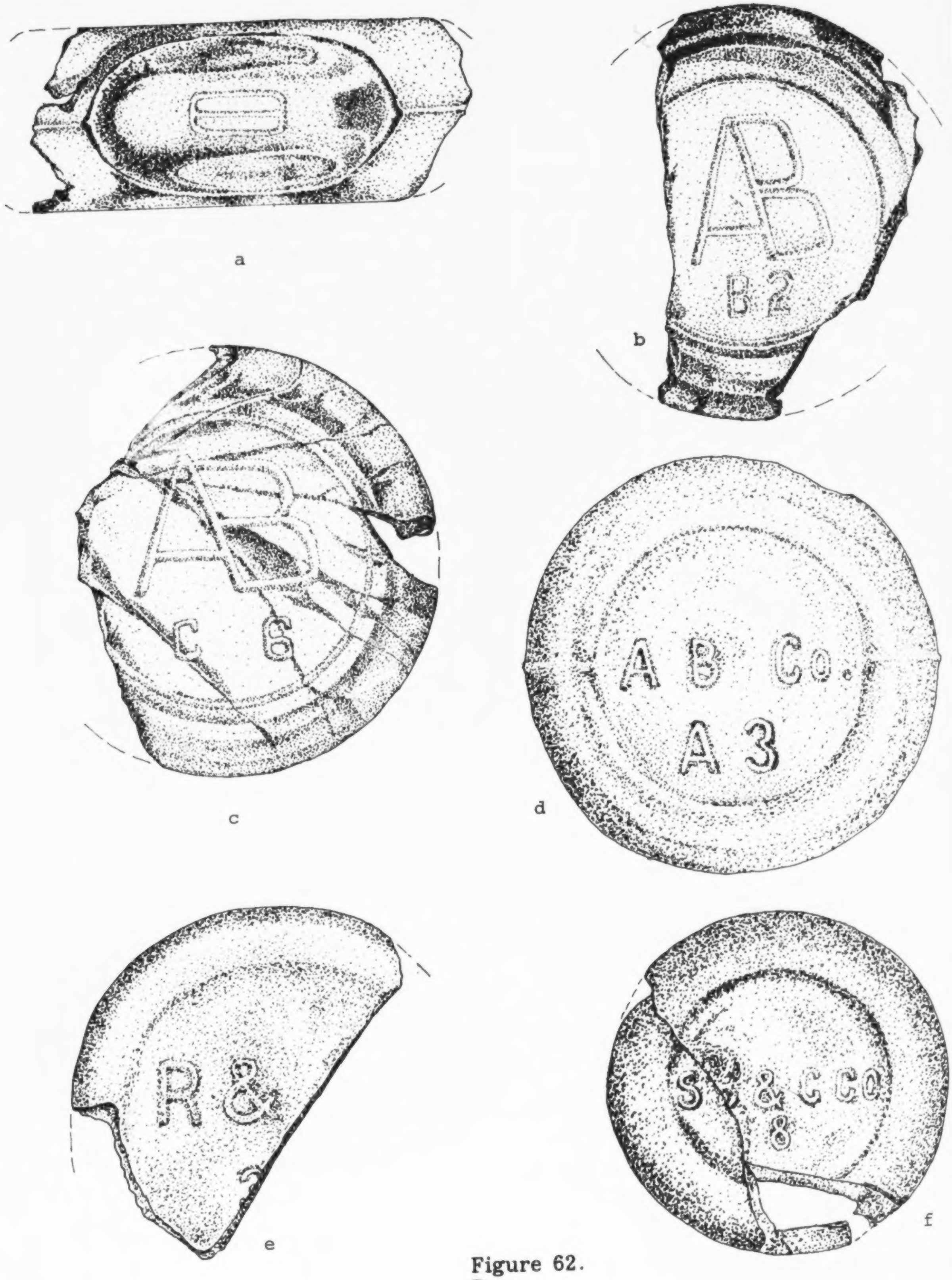

a
AB
B2
b
AB
C 6
c
A B Co.
A3
d
R &
e
S & C Co
8
f

Figure 62.
Bases.

2. Figure 62d
Embossing: All are marked A B Co.; in addition, one is marked A3, one 8, one 11, and one 50.
Color: brown (1) and aqua (5)
Type: border with a slight push-up
Provenience: Structure 4
Description: The mold seams extend under the heel to a circular seam around the marks.
History: This mark, according to Toulouse (1971:30), belonged to the American Bottle Company, Chicago, Illinois (1905-1916), or Toledo, Ohio (1916-1929). It was formed by the merger of the Ohio Bottle Company (1904-1916), the Streator Bottle and Glass Company (1881-1905) and the Adolphus Busch Glass Manufacturing Company (1886-1928). In 1916 the American Bottle Company was purchased by the Owens Bottle Machine Company but retained its identity until 1929, when the merger of the Owens Bottle and Illinois Glass formed the Owens-Illinois Glass Company.
Dates: 1905-1916
No. of specimens: 6
Compare: Toulouse (1971:30); Jones (1966:15)

3. Figure 62e
Embossing: R & . . . probably R & Co.
Color: brown
Type: border with a push-up
Provenience: Structure 4
Description: The mold seam runs around the base of the heel on the round base. The glass in the base is thick.
History: This mark could mean Roth and Company, San Francisco, California (1879-1888); Ripley and Company, Birmingham, Pennsylvania (1866-1889); or some unknown manufacturer. Roth and Company made whiskey bottles; however, this base is from a beer bottle (Toulouse 1971:438-439; and Jones 1968:24).
Dates: 1881-1905
No. of specimens: 1
Compare: Toulouse (1971:438); Jones (1968:24-26)

4. Figure 62f
Embossing: SC & G Co with an 8 underneath and one with a 2 underneath
Color: brown
Type: border with a flat center
Provenience: Structure 4
Description: The mold seam is around the base of the heel.
History: This trademark belongs to the Streator Bottle and Glass Company, Streator, Illinois (1881-1905). It was incorporated by William W. Haskell, Hiram N. Ryon, and William J. Williams, with others joining later in the venture. The Streator Flint Glass Works (1890-1898) was purchased in 1898, with a trademark of S F G W.

The Streator Bottle and Glass Company in 1905 merged with the Ohio Bottle Company and Adolphus Busch to form the American Bottle Company (Toulouse 1971:461-463).
Dates: 1881-1905
Compare: Toulouse (1972:438); Jones (1968:24-26)

5. Figure 63a
   Embossing: W. F. & S. and MI . . .
   Color: brown (1) and aqua blue (1)
   Type: border with a slight push-up
   Provenience: Structure 4
   Description: This round base has a mold seam under the heel extending to the base border. It also has a seam around the heel.
   History: See the description of Figure 46e.
   Dates: 1900-1921
   No. of specimens: 2
   Compare: Jones (1966:18 and 26); Toulouse (1971: 536 and 537); Noyes (1962:2-8)

6. Figure 63b
   Embossing: C & Co. LIM, 1
   Color: brown
   Type: border with a slight push-up
   Provenience: Structure 4
   Description: The mold seam extends around the heel at the base.
   History: This trademark may have belonged to Cunningham and Company, Pittsburgh, Pennsylvania (1879-1907); however, this company's seem to have been marked C & Co., whereas the base found at Simpson Springs is additionally marked with LIM, standing for Limited. This bottle may be Canadian or British, since it was more their practice to add "Limited" to their company names than it was for American firms.
   Dates: 1880-1913
   No. of Specimens: 1
   Compare: Toulouse (1971:119)

7. Figure 63c-d
   Embossing: 63B on the heel
   Color: light green
   Type: border with a concave center
   Provenience: Structure 4
   Description: This round base has a mold seam extending to the base border (post-bottom).
   No. of specimens: 1

8. Figure 63e
   Embossing: none
   Color: brown

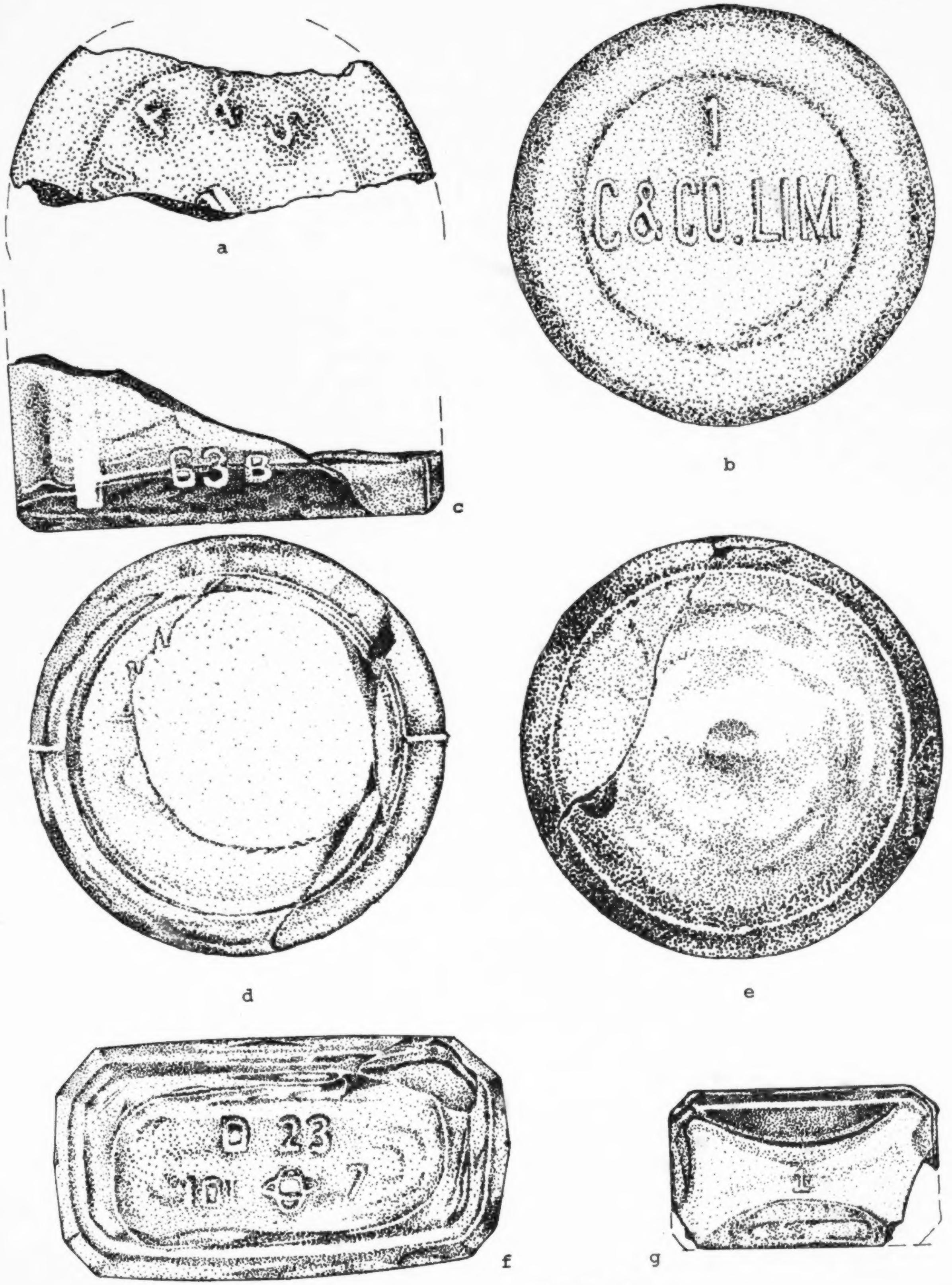

a
1
C&CO.LIM
b
63 B
c
d
e
D 23
10 7
f
g

Figure 63.
Bases.

Type: border with a concave base and a large relief dot in the center
Provenience: Structure 4
Description: The bottle was turned in the mold, but a slight seam can be seen on the heel of this round base.
No. of specimens: 1

9. Base fragment
Embossing: none
Color: brown
Type: indented center
Provenience: Structure 4
Description: The mold seams are almost obliterated, but they extend around the heel.
No. of specimens: 1

D. Champagne bottle

1. Base fragments like Figure 45k
Embossing: none
Color: olive green
Type: kick-up
Provenience: Structure 2 (1) and Structure 4 (4)
Description: Only pieces of the kick-up remain.
No. of specimens: 5
Compare: Blumenstein (1966:27 and 1965:37-38)

II. Non-alcoholic Beverage Bottles--none

III. Bitters-Bottles

1. Bases like Figure 52b
Embossing: none
Color: purple (2) and brown (1)
Type: circular indentation in a square border base
Provenience: Structure 1 (1), Structure 2 (1) and (1).
Description: very fragmented
No. of specimens: 3

IV. Pharmaceutical and Cosmetic Bottles

A. Medicine bottles

1. Figure 63f
Embossing: D23, 10, 7, O over diamond
Color: clear
Type: border--blake
Provenience: Structure 4
Description: The mold seams come down the sides and form a ring around the heel. There is an irregular, somewhat circular groove around the base--the cutoff scar (Munsey 1970:40) typical of the Owens bottle machine.

History: According to Toulouse (1971:4-6-408) this trademark belonged to the Owens-Illinois Pacific Coast Company, San Francisco, California (1932-1943).
Dates: 1932-1943
No. of specimens: 1
Compare: Jones (1965); Toulouse (1971:403 and 406)

2. Figure 63g
   Embossing: 1
   Color: purple
   Type: border--blake
   Provenience: Structure 4
   Description: The mold seam is around the heel.
   Dates: 1880-1925
   No. of specimens: 1

3. Figure 64a
   Embossing: A over 810
   Color: light green
   Type: border--blake
   Provenience: Structure 4
   Description: The sides appear straight and not oblique as on ink bottles.
   No. of specimens: 1

4. Base like Figure 38s
   Embossing: none
   Color: aqua blue
   Type: slightly concave
   Description: There is not enough of the heel to detect mold seams.
   No. of specimens: 1

5. Figure 64b, like Figure 47f
   Embossing: two are marked IG Co in a diamond
   Color: clear
   Type: border--oval like Figure 38n
   Provenience: Structure 4
   Description: The mold seam extends down the sides of the bottle and terminates at a seam around the heel (cup-bottom).
   History: See Figure 60c-f and Figure 49b-c.
   Dates: 1900-1916
   No. of specimens: 6
   Compare: Toulouse (1971:264-268)

V. Household Bottles

A. Fruit jars

1. Figure 64c
   Embossing: 6
   Color: light green (1) and aqua blue (1)

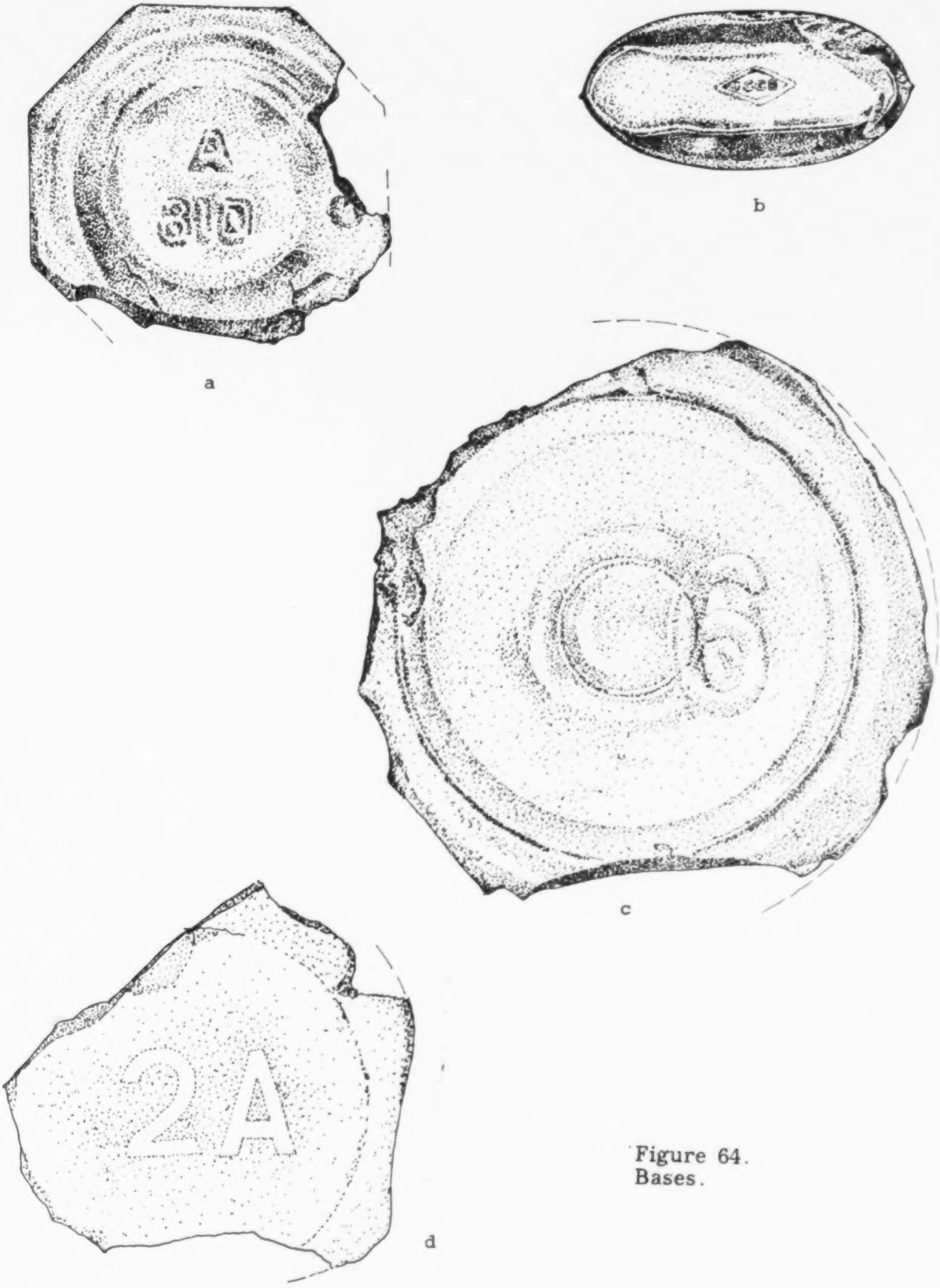

A
810
a
b
C6
c
2A
d

Figure 64.
Bases.

Type: border--round like Figure 38i
Provenience: Structure 4
Description: The base is slightly concave, with a circular groove in the center.
No. of specimens: 2

2. Base like Figure 38i
Embossing: none
Color: clear (1), light green (1), dark aqua blue (1), and aqua blue (1)
Type: border--round
Provenience: Structure 4
Description: On the light green and dark aqua blue bottles the mold seams extend under the heel to a circular seam on the base (post-bottom). On the aqua blue and clear bases the mold seams are on the heel (cup-bottom).
No. of specimens: 4

3. Figure 64d
Embossing: 2A, 1 and HOG
Color: light green (1) and aqua blue (1)
Type: border--round like Figure 38i
Provenience: Structure 4
Description: The mold seams extend under the heel to a circular seam on the base (post-bottom).
No. of specimens: 3

4. Figure 65a
Embossing: I in a diamond with the number 6 underneath
Color: aqua blue
Type: border--round
Provenience: Structure 4
Description: The mold seam is around the heel (cup-bottom).
History: This trademark belonged to the Illinois Glass Company, Alton, Illinois (1873-1929). For further historical data see Toulouse (1971:264-268).
Dates: 1916-1929
No. of specimens: 1
Compare: Jones (1965); Toulouse (1971:264)

5. Figure 66a-c
Embossing: SCHRAM ST LOUIS with a 3 in the center of the base.
Color: clear
Type: border--round
Provenience: Structure 4
Description: There are no mold seams on the base. A section of the body is illustrated in Figure 66a.
History: This trademark belongs to the Schram Glass Manufacturing Company, St. Louis, Missouri (1915-1925), which embossed "Schram" on its automatic-sealer fruit jars and "Drey" on Mason and

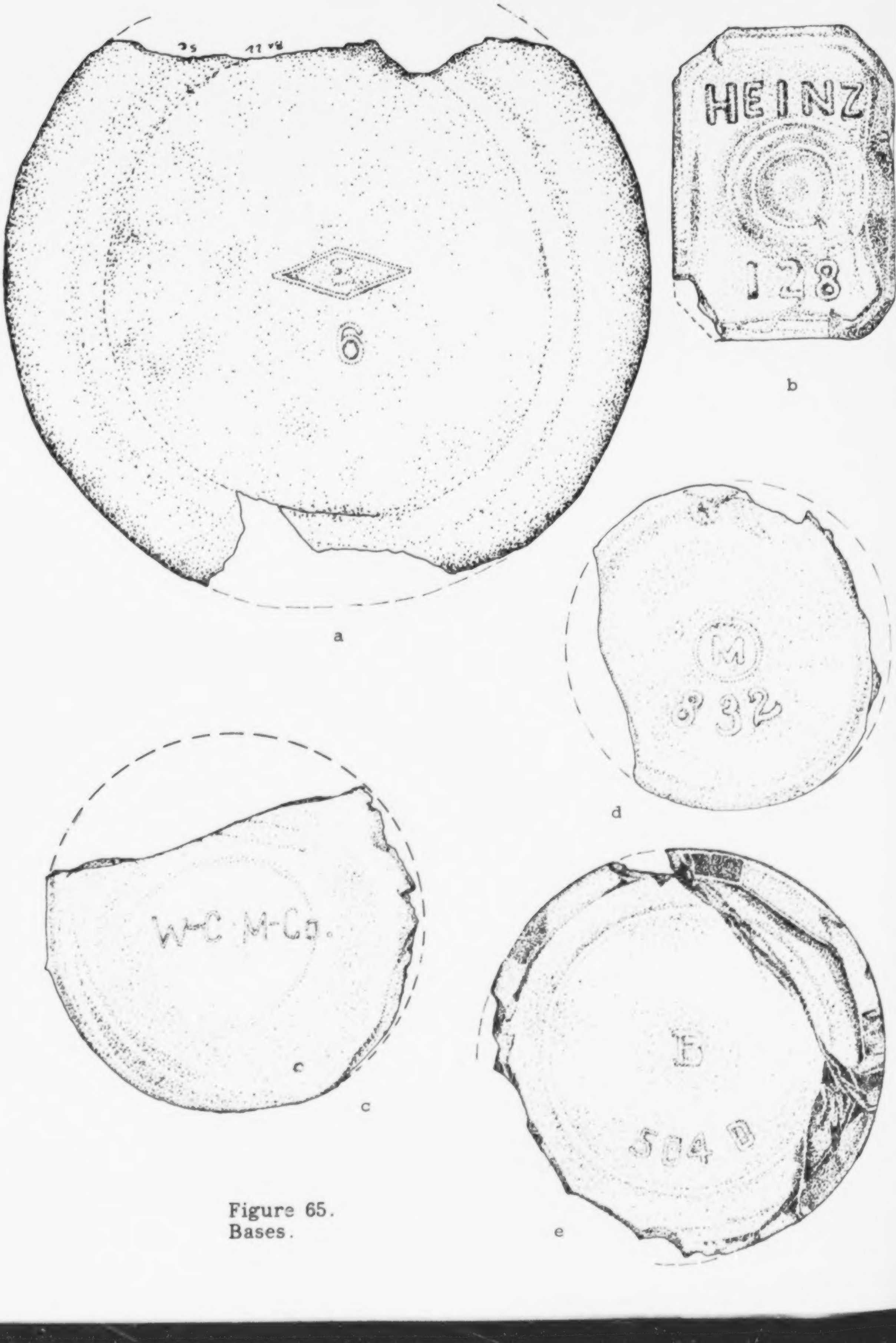

6
a
HEINZ
128
b
M
832
d
W-C M-Co.
c
c
B
584 D
e

Figure 65.
Bases.

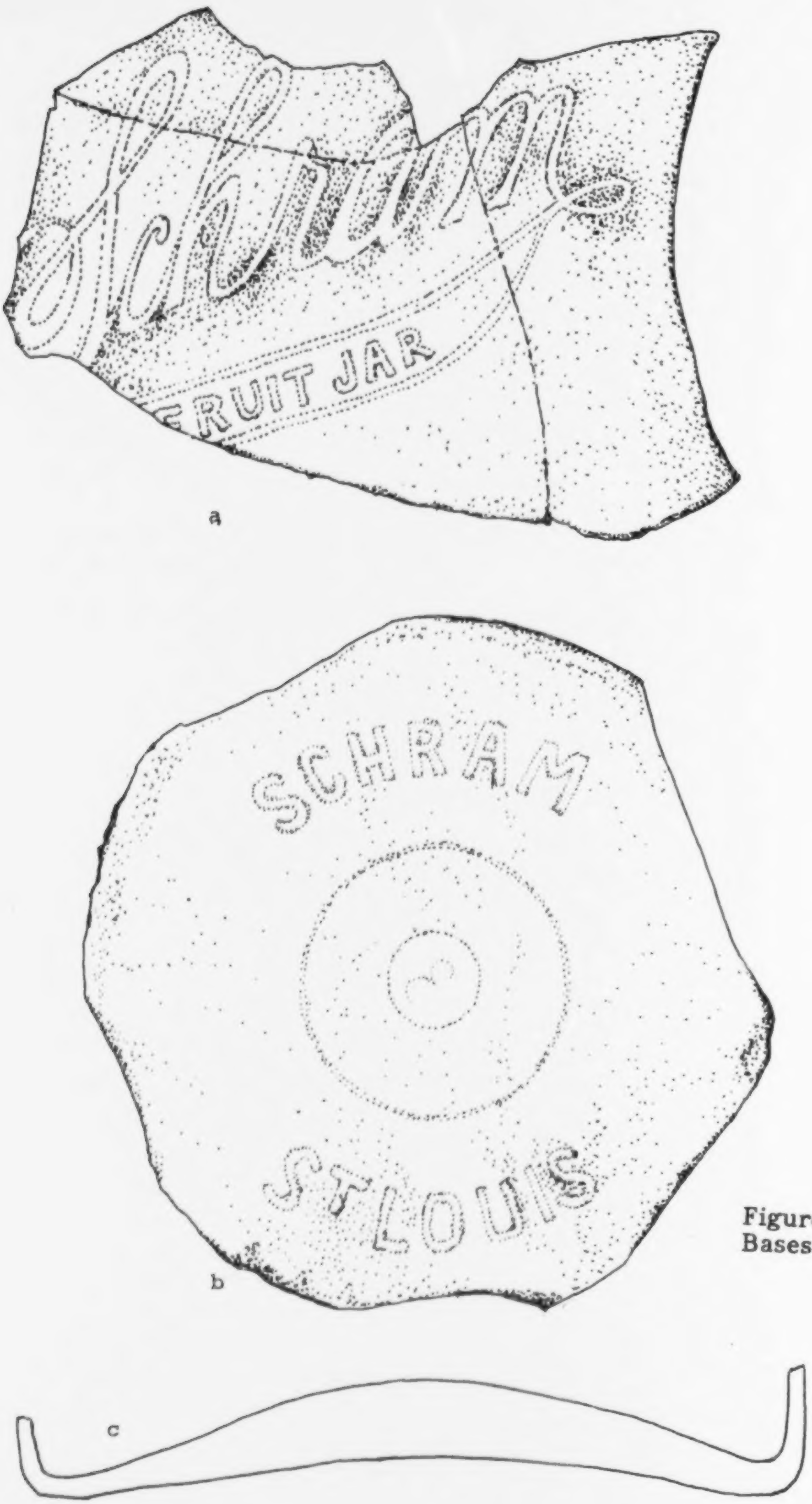

Schram
FRUIT JAR
a
SCHRAM
ST LOUIS
b
c

Figure 66.
Bases.

Lightning jars. SCHRAM marked jars were discontinued about 1915. The company was sold to Ball Brothers in 1925. The Pierce Glass Company, Clayton, New Jersey, made the "Automatic Sealer" jars from 1895 to 1905 (Toulouse 1971:166, 465-466).
Dates: 1906-1915
No. of specimens: 1
Compare: Toulouse (1971:465); Blumenstein (1966:50)

B. Horseradish or ketchup bottle

1. Figure 65b
Embossing: HEINZ with 128 underneath
Color: light purple
Type: border--blake like Figure 38r
Provenience: Structure 4
Description: The mold seam is around the heel; in the center of the base is a slightly raised circular area.
History: See description of Figure 23.
Dates: 1888-1925
No. of specimens: 1
Compare: Toulouse (1971:236)

C. Relish bottles

1. Figure 65c-e, and like Figures 48c-d, 48e-f, 48h-i, 49a and 49d.
Embossing: 7, WGM Co (Figure 65c), M in a circle with 832 underneath (Figure 65d), B with 504D underneath (Figure 65e), and one plain
Color: clear (3) and purple (2)
Type: border--round like Figure 38i
Provenience: Structure 4
Description: On four of these bases the mold seam is around the heel. The base marked 7 has a mold seam that extends under the base.
History: Jones (19661:8) suggests that the WGM Co mark could belong to Williamstown glass Manufacturing Company (1866-1917); see Figure 45e-f for M in a circle; and the B mark may be the same as Figure 45a-b.
Dates: 1880-1925
No. of specimens: 5
Compare: Jones (1966:18)

D. Spice bottle

1. Figure 67a
Embossing: A. SCHILLING & Co around 2 OZ. NET
Color: purple
Type: border--square
Provenience: Structure 4

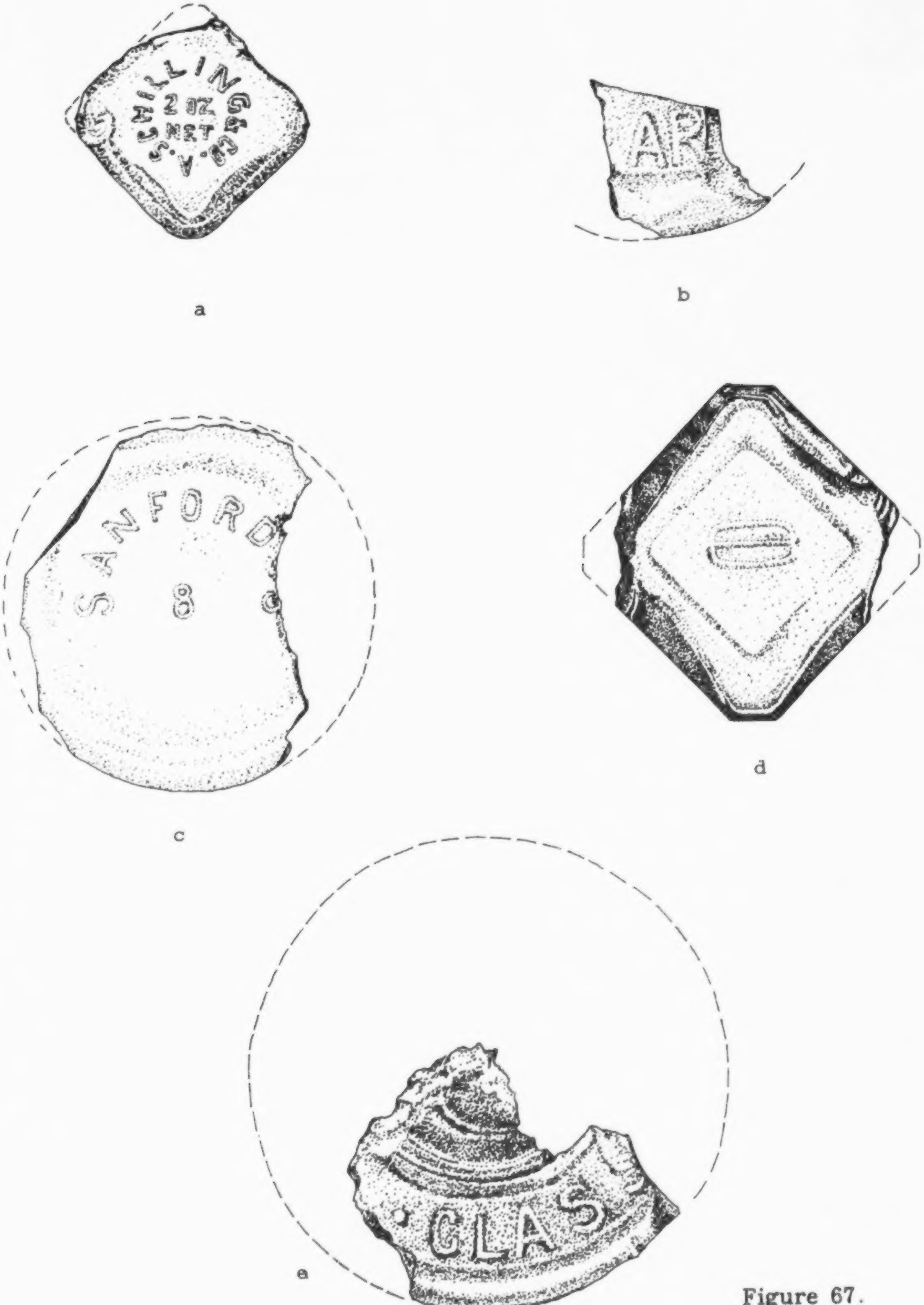

A. SCHILLING & CO.
2 OZ.
NET
a
AR
b
SANFORD
8
c
d
CLAS
e

Figure 67.
Bases.

Description: The mold seam is along one edge of the body and extends around the heel.
History: This base mark belonged to the A. Schilling & Company, San Francisco, California (1881-1947), founded by August Schilling and George F. Volkmann, who produced food and spices. The word "NET" was added to their label long before it was required by national packaging laws. They provided most of the spices in the west by 1905. In 1947 it became a division of McCormick & Company (Toulouse (1971:52-53).

E. Ink bottles

1. Figure 67b
Embossing: ...CAR... possibly for CARTER'S
Color: purple
Type: border--round
Provenience: Structure 2
Description: The mold seam is around the heel (cup-bottom).
History: See Figure 22 for historical data.
Dates: 1880-1913
No. of specimens: 1
Compare: Eastin (1965:47-51); Ferraro and Ferraro (1964:5)

2. Figure 67c
Embossing: SANFORD'S with 8 in the center
Color: aqua blue
Type: border--round
Provenience: Structure 4
Description: The mold seam is on the under ridge of the base.
No. of specimens: 1
Compare: Covill (1971:77)

VI. Miscellaneous Bottles

A. Round bottle

a. Base fragments
Embossing: none
Color: aqua blue (2), clear (4) and purple (3)
Type: border--round
Provenience: Structure 4
Description: Most have mold seams around the heel, but two are void of mold seams at the heel or base.
Dates: 1880-1925 (?)
No. of specimens: 9

B. Square bottle

1. Figure 67d
Embossing: line through oval shape as in Figure
Color: light purple

Type: border--square
Provenience: Structure 4
Description: The mold seam is around the heel (cup-bottom).
Dates: 1880-1915
No. of specimens: 1

C. Black Glass bottle

a. Figure 67e
Embossing: GLAS...; others are plain.
Color: dark olive green (black)
Type: border--round
Provenience: Structure 2 and Structure 4
Description: The bottle embossed with GLAS... is from Structure 2 and has no mold seams present on the fragment Mold seams on the other pieces are not visible either.
No. of specimens: 2

Other Glass Artifacts

Flat Glass

Lorrain (1968:37) described three methods of producing flat window glass in 1800, i.e., crown, cylinder and casting. The crown method is characterized by "the small size of sheets," "a thick bull's eye of glass in the center where the pontil is attached," considerable variance "in thickness from the center to the edge of the sheet," and "curved distortion lines or waves," detectable in oblique light.

The cylinder method produces glass that is "more uniform in thickness," "can yield larger panes," and has straight distortion lines; but "a sizable sherd is necessary to detect them."

In the casting method, plate glass was produced. This glass had to be hand-ground and polished, making it expensive; it was therefore used mostly for small mirrors. However, this glass was very clear and lacked distortion.

At Simpson Springs all of the flat window glass, which accounted for 606 fragments of the glass total, was aqua-blue in color. More than half of the flat glass came from Structure 1, with approximately one-fourth coming from Structures 3 and 4. Only 2 fragments were found in Structure 2 (chart 3).

Buttons

A total of 22 buttons and one bead were recovered during the excavation of Simpson Springs. Of this total 12 were glass, 9 were shell, and one was a hard rubber button. From Structure 1, one button was black glass with a design on the front and a metal eyelet on the back (Figure 68a-b); one brown glass button was 14 mm in diameter

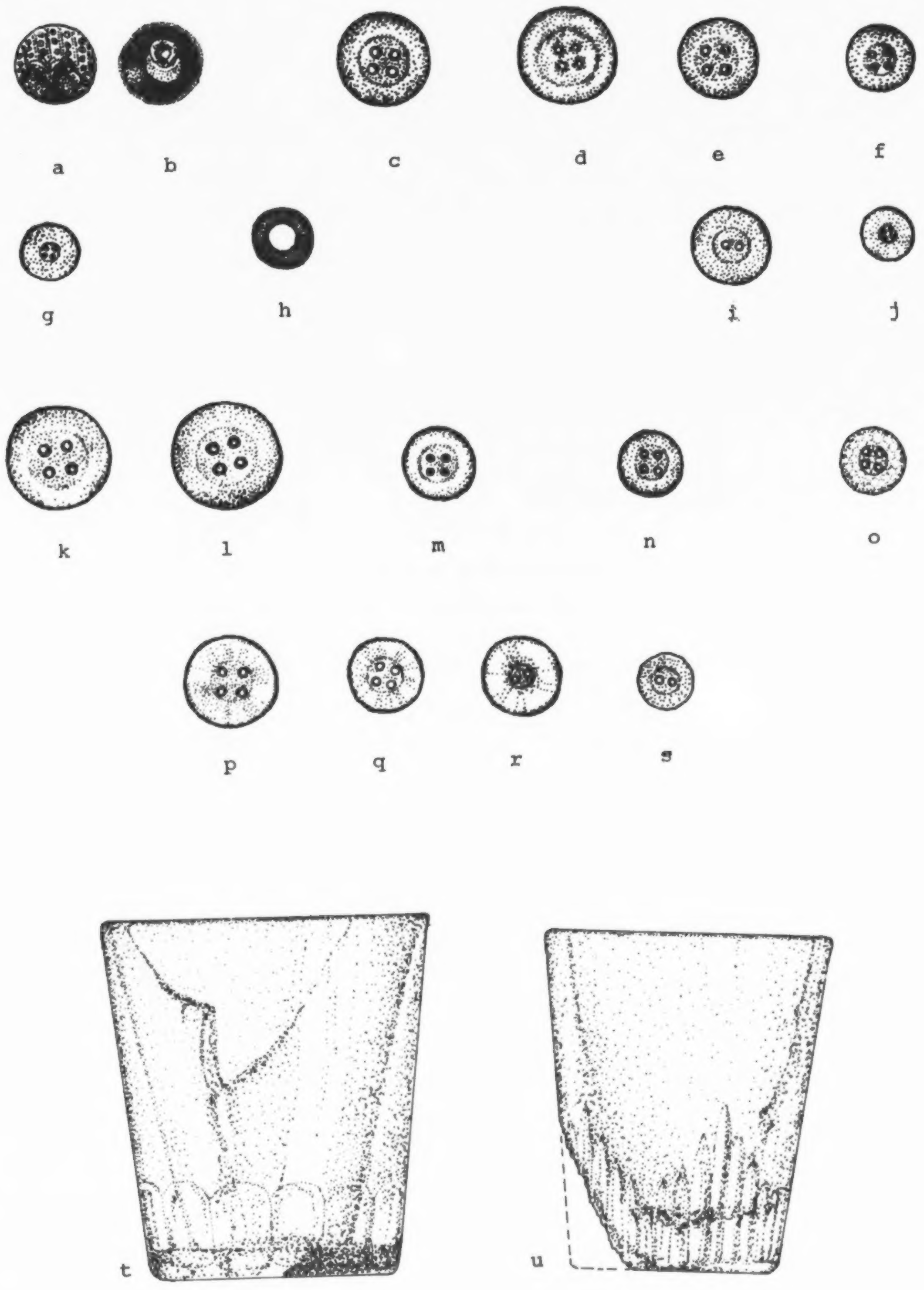

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u

Figure 68.
Buttons and tumblers.

(Figure 68c); three others, each progressively smaller, were white glass (Figure 68d-f); and one shell button was 9 mm across (Figure 68g). The bead (Figure 68h) was made of black glass.

One of the two buttons from Structure 2 was of hard, black rubber (Figure 68i), and one was of shell (Figure 68j). No buttons were found in Structure 3.

The largest white glass button from Structure 4 (Figure 68k) was 18 mm across, while the others graded down to 11 mm across (Figures 68 l-o). One (Figure 68o) was decorated in a red floral pattern. The shell buttons ranged in size from 15 mm to 9 mm across the diamter (Figures 68p-s).

Small Tumblers

Two small tumblers, commonly known as shot glasses, were recovered from Structure 4. One tumbler was 6 cm tall (Figure 68t), while the other was 5.8 cm in height (Figure 68u).

Lamp and Lantern Chimneys

All the specimens in this group came from Structure 4. Lamp chimney parts numbered six, of which four were the chimney crown (Figure 69a); and two were fragments of the base. Lantern chimney fragments numbered ten (Figure 69b-d).

Insulators

Insulators have a long history in the United States and the West. Historical factors pertaining to this development are outlined below:

1753--British experimenters worked with electric devices to carry messages.

1800--Alessandro Volta, an Italian, developed the electric battery.

1816--John Coxe and Harrison Dyar (in 1828) developed devices to send signals by wire.

1820--Hans Christian Oersted, Denmark, learned that electric impulses detected magnetically.

1831--First electro-magnetic apparatus invented by Joseph Henry, Albany, New York.

1832--First electro-magnetic telegraph invented by S.F.B. Morse.

1844--First public telegraphic message.

1844--Inverted cup of glass insulator invented by Ezra Cornell; first telegraph insulators.

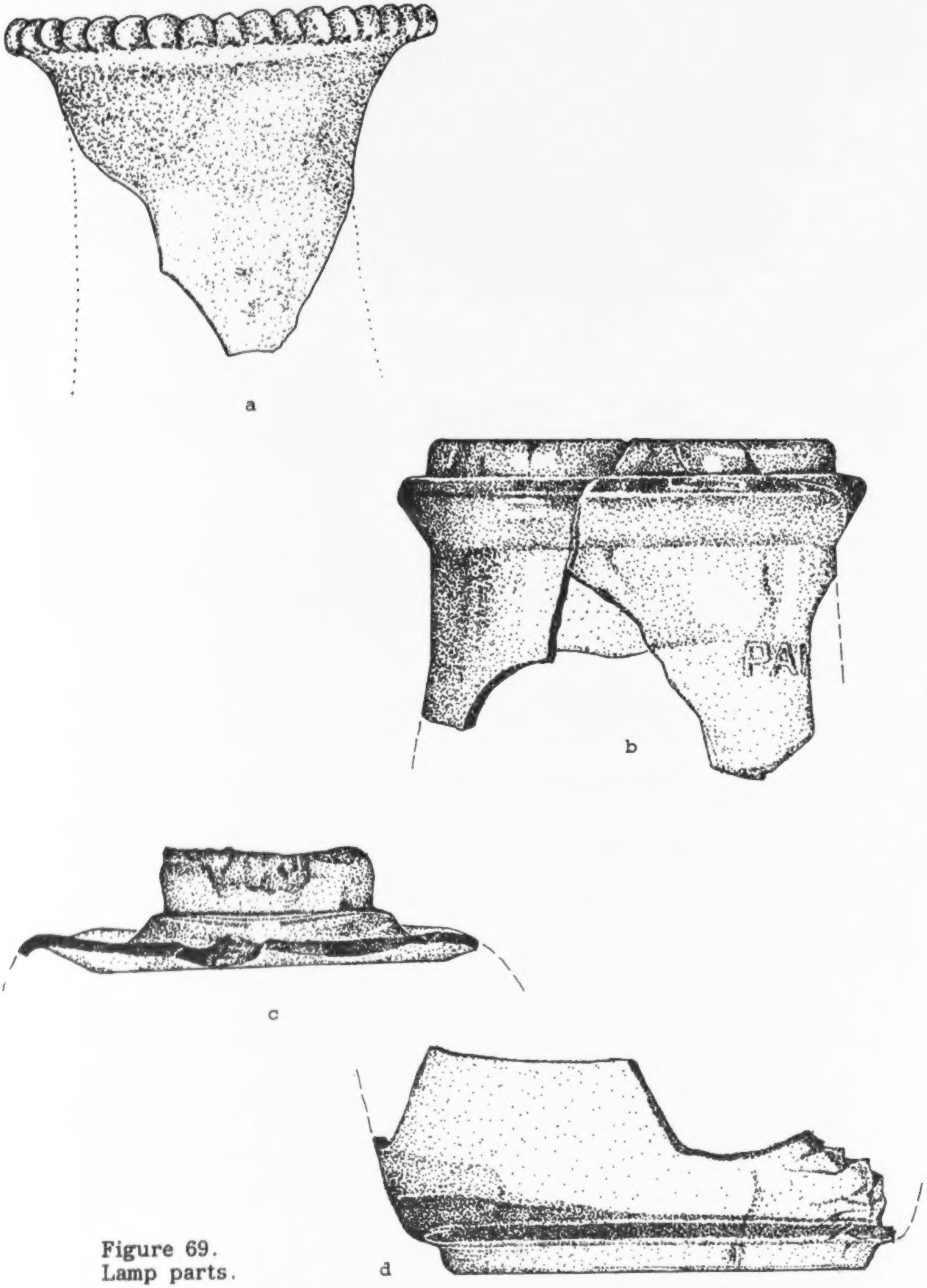


Figure 69.
Lamp parts.

1851--Goodyear ramshorn insulator patented.

1855--Western Union Telegraph Company organized.

1858--Bee, Lovell, Bishop, Jones, and Randall organized the Placerville, Humboldt and Salt Lake Telegraph Co.

1865--Louis A. Canvet patented first threaded pin hole in insulators. Before this time, insulators had no threads.

1867--"Rams Horn" insulator patented.

1868--Brookfield insulators, 55 Fulton St., 1868-1882; 45 Cliff St., 1882-1890; 80s Fulton St., 1890-1897.

1869--Gray and Barton, 1869-1872; reorganized as Western Electric Manufacturing Company; 1881 reorganized as Western Electric of Illinois.

1871--Hemingray patent first issued.

1871--Mold line ran up to a "button on top of dome," until 1900.

1871--Electrical Construction and Maintenance Company founded.

1872--Hawley Glass Works, Hawley, Pennslyvania, started in 1872 and incorporated in 1885.

1874--Central District and Printing Telegraph Company founded; 1913 changed to Central District Telephone Co.; 1918 became part of Bell Telephone Co.

1874--Hemingray Glass Co. started.

1876--First successful use of telephone made by Alexander Graham Bell, Boston.

1876--First telephone insulators.

1876--Grounded circuits used to 1890.

1877--California Electrical Works founded in purchase of the Electrical Construction and Maintenance Company and the California Electrical Power Coompany. It continued in 1908.

1878--Bell Telephone Company organized.

1879--Southern Bell Telephone and Telegraph Company founded.

1880--Merger of American Speaking Telephone Company and National Bell Telephone Company into Pacific Bell Telephone Company.

1880--Pole construction for telephone wires in the cities.

1883--Samuel Oakman patented "Double Petticoat" insulator.

1883--T.H.E. Co. founded; lasted until 1892.

1884--"Beehive" or standard shape after this date.

1885--Mold line came over the dome and there was no flat collar at the base of the threads, until 1890.

1888--Patented "Transposition Scheme" for two wire circuits.

1890--Two wire Telephone System until 1999.

1890--Cable Glass or "Saddle Groove" insulator patented by Samual Oakman.

1890-Mold tine on the widest, uppermost ridge after this date.

1892--Fred M. Locke began making porcelain insulators.

1893--Hemingray and Gill patented "Drip points"; later points not as sharp.

1895--Robert Good, Valverde, Colorado; 1895-1896 marked "R. Good Jr. Denver."

1897--Valverde Glass Works, Denver, made insulators until 1899.

1899--First wireless telegraph used by Marconi.

1899--Hemingray Provo No. 1, patented by V.G. Converse.

1900--Western Flint Glass Company built plant; changed name in 1901 to Western Glass Manufacturing Co.; destroyed by fire in 1909.

1903--"Brookfield New York" embossed on insulators after this date, but prior to those marked only "Brookfield." Those embossed "W. Brookfield New York" are prior to this date.

1912--California Glass Insulator Company, Long Beach; lasted until 1916.

1920--Brookfield ceased production.

1920--McLaughlin Glass Company, Los Angeles, California, 1920-1935.

1920--Whitall Tatum began production of insulators: marked "Whitall Tatum Co."; 1924 added "WT" in triangle.

1923--Corning Glass Works made insulators of pyrex glass until after World War II.

1923--Lynchburg Glass Corp. made insulators for about one year.

1933--Hemingray was sold to Owens, Illinois. Hemingray name carried on.

1935--Maydell Plant of Crystaltic Products Corporation; operated until 1940.

1938--Armstrong purchased Whitall Tatum but continued to emboss "Whitall Tatum" on insulators until 1946. Circle "A" added 1939.

1943--Postal Telegraph Company purchased by Western Union.

Other insulator manufactures or purchasers include the following (Milholland 1969: 7-8; and, Tibbitts 1969:104-105):

Agree
A.G.M.
American Insulator Co.
Am. Tel. & Tel. Co.
Armstrong
A.T. & T.
B
B (in circle)
Babson Bros. Co.
B.G.M. Co.
B. & O.
Boston Bottle Works
Brooke
Brookfield (all)
Brooks
B.T.C. Canada (all)
Continental Rubber Works
Converse
Corning
Corning-Pyrex
C.P.R.R.
C. & P. Tel. Co.
Cutter
  (Diamond)
Dominion
Duquesne Glass Co.
Dwight
E.C. & M.
Electric Supply Co.
E.R.
E.R.W.
Floy
Foster Brothers
F.W.E. Co.
Gayner

B.T.C. Montreal
C
Cable
Cal. Elec. Works
California
Canada
Canadian Pacific Ry. C.
Cauvet
C.C.G.
C.D. & P. Tel. Co.
C.E.L. Co.
C.E.W.
C.G.I. Co.
Chi. Ins. Co.
Chicago Insulating Co.
Columbia
McLaughlin
M. & E. Co.
Mershon
Montreal Telegraph Co.
M.T. Co.
Mulford & Biddle
N.A.T. Co.
Nat. Insulator Co.
N.E.G.M. Co.
New Eng. Tel. & Tel. Co.
N.W. & B.I.T. Co.
Oakman Mfg. Co.
O.V.G. Co.
P (in diamond)
P. & W.
Pettingell Andrews
Pinco
P.L.W.
Postal

G.E. Co.
G.N.W. Tel. Co
Good
R. Good, Jr.
Gregory
H
Hawley
Hemingray
H.G. Co.
I.E.P.
Imperial Porcelain Works
Isorex
Jeffrey Mfg. Co.
Jumbo
K.C.G.W.
Kimble
Knowles
L.A.C.
L'Electro Verre
L.G. Tillotson
Liquid Insulator
L.G.T. & Co.
Locke
Lowex
Lynchburg
M (in triangle)
Macomb
Manhattan
Postal Tel. Co.
P.R.R.
Pyrex
Rd 149959
Santa Ana
S.B.T. & T. Co.
Seiler
S.F.
Standard
(Star)
Sterling
Surge
T.H.E. Co.
Thomas
Universal
U.P.R.R.
U.S. Tel. Co.
V (in square)
V.M.R. Napoli
Westinghouse
W/E
W.E. Mfg. Co.
W.F.G. Co.
W.G.M. Co.
Whitall Tatum
W.U.
W.U.T. Co.

Patents issued pertaining to insulators include the following (Milholland 1969:144-145):

Number 48,906--July 25, 1865 Louis A. Cauvet internal screw thread.

Number 99,145--Jan. 25, 1870 To a Homer Brooke, for Hand press for making insulators.

Patent No. 3,847--Feb. 22, 1870 Louis A. Cauvet re-issue of patent No. 48,906.

Patent No. 122,015--Dec. 19, 1871 to Robert Hemingray for Process of forming glass insulators.

Design Patent number 9,858--March 20, 1877 to a Mr. James M. Brookfield. "Telegraph" Insulator.

Design Patent Number 10,981--Jan. 14, 1879 to a Mr. James M. Brookfield. "Pony" Insulator.

Patent No. 247,100--Sept. 13, 1881 Samuel Oakman assigned to Edward C. Sherburne. The process of forming threads in glass.

Number 282,989--Aug. 14, 1883. Mathew Johnson-Hand press for making insulators.

Number 286,801--Oct. 16, 1883 to Bradley A. Fiske and Samuel D. Mott-Wire groove composed of series of diamond shaped indentures.

Patent No. 288,360--Nov. 13, 1883 to Samuel Oakman. Double petticoat.

Patent No. 14,674--Feb. 12, 1884 to Samuel Oakman. Double petticoat telegraph insulator.

Patent No. 353,120--Nov. 23, 1886 to Robert G. Brown, assigned to E. S. Greeley and Co. Through pin-hole, for use on pin projecting downward from crossarm.

Patent No. 430,296--June 17, 1890 to Samuel Oakman. Saddle Groove

Patent No. 434,879--Aug. 19, 1890 to Samuel Oakman. Ridges around inner surface of skirt.

Patent No. 443,187--Dec. 23, 1890 to Foree Bain. Ridges around outside of skirt.

Patent No. 451,950--May 12, 1891 to Samuel Oakman. Eyes for tie-wire, as part of wire groove.

Patent No. 496,652--May 2, 1893 to Ralph G. Hemingray and James C. Gill. Drip points.

Patent No. 520,367--May 22, 1894 to Fred M. Locke. Transposition insulator.

Patent No. 526,498--Sept. 25, 1894 to David N. Osyor and assigned to Joseph A. Jeffrey. Mine insulator.

Patent No. 545,819--Sept. 3, 1895 to D.M. Rothenberger. Hole through crown for tie wire.

Patent No. 26,323--Nov. 24, 1896 to Fred M. Locke. Insulator with sleeve to protect pin.

Patent No. 30,637--Apr. 25, 1899 to George Converse and assigned to Hemingray Glass Co. Provo Insulator.

Patent Nos. 633,173; 633,174; 633,175; and 633,176 issued on Sept. 19, 1899 to Fredrick H. Withycombe. Exterior projections to absorb mechanical shock.

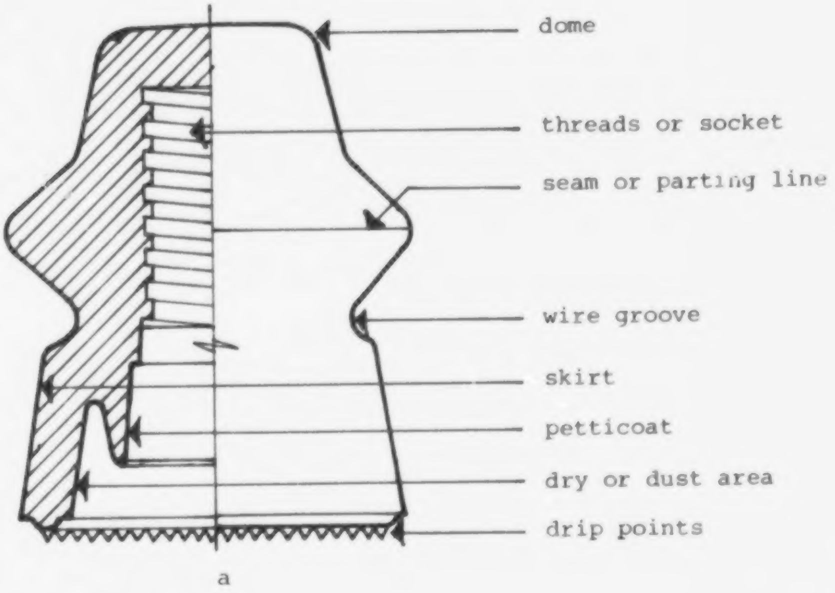
Patent No. 724,848--Apr. 7, 1903 to Ferdinand W. Gregory. Wire groove with flat surface for line wire.

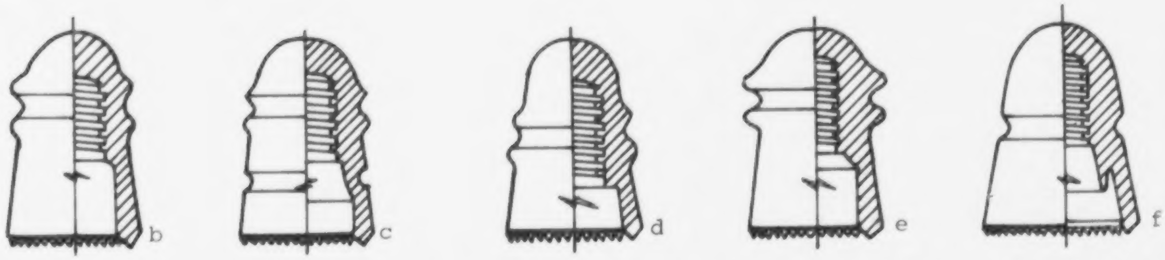
Patent No. 867,901--Oct. 8, 1907 to John C. Barclay. Spiral groove above wire groove.

Often only fragments of insulators are recovered from historic archaeological sites. Figure 70a provides the nomenclature of the characteristics of a typical insulator. Several common types of insulators appear in historic sites in the west. Some of these are illustrated in Figures 70b-j.

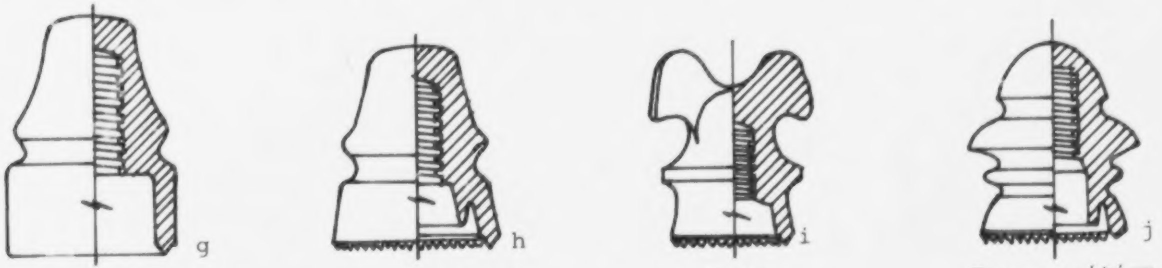
During the excavation of Structure 1, four very badly corroded insulators of this type, known as "ram horns" were found (Fike 1966:9). Figure 71d is an illustration of the type found at Simpson Springs (provided by Richard Fike, Willard, Utah). Regarding this type of insulator, Fike (1966:9) states:

> *The first insulators, to be used in the west, were made of iron coated with zinc. One of the primary reasons for metal insulators was the fact that glass was highly prized and sought after by the Indians for the making of beads and arrowheads. The "Rams Horns", as they were called, were patented by Brooks Aug. 6, 1867. Composed of sulphur, gutta percha and lined with glass, they were manufactured until approximately 1880.*


dome
threads or socket
seam or parting line
wire groove
skirt
petticoat
dry or dust area
drip points
a



Pony Double Groove Pony National Pony Western Union Standard



Regular Double Petticoat Cable Transposition

Figure 70.
Nomenclature of insulators and various types (a after Saccoman 1967: 9).

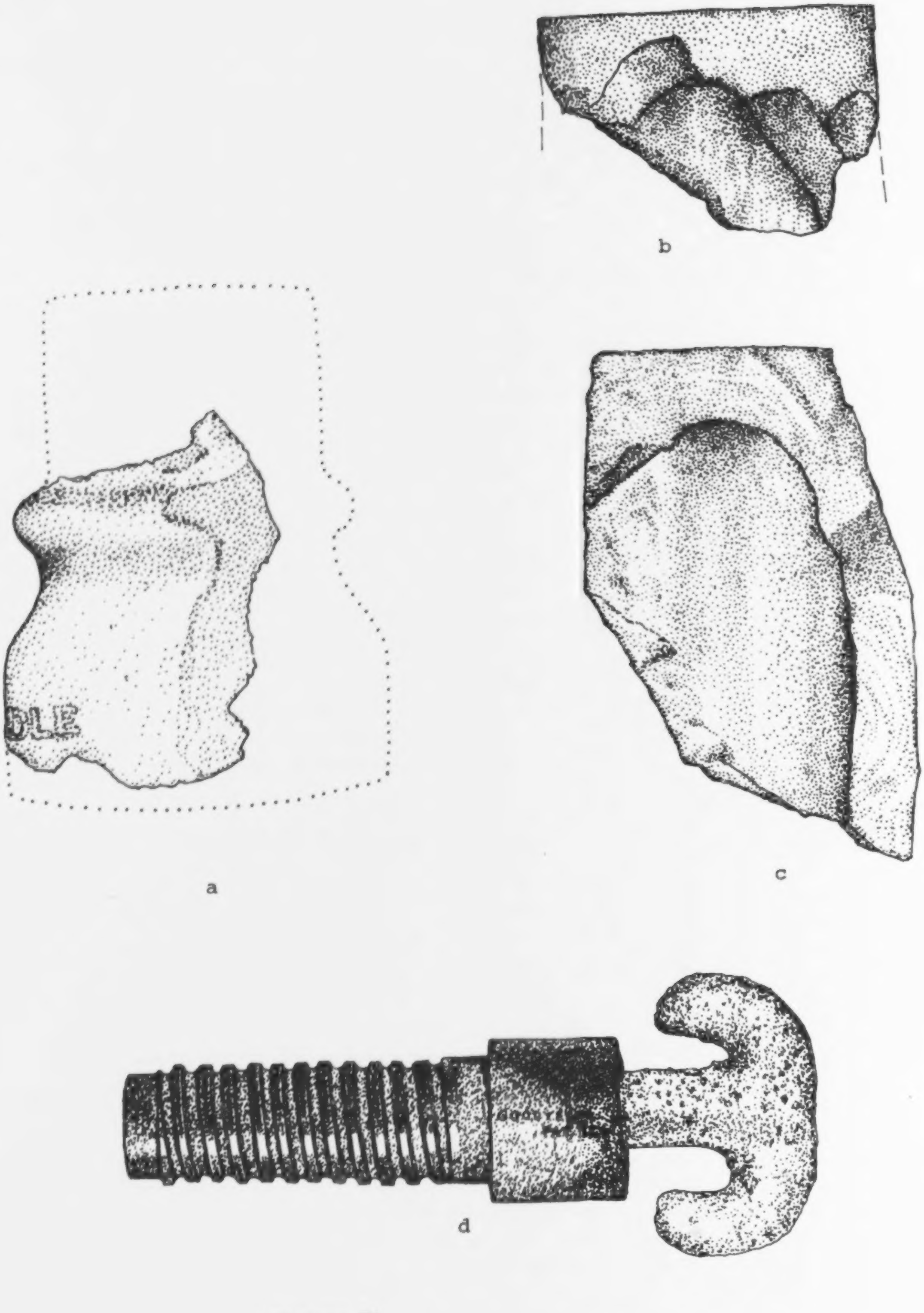


Figure 71.
Insulators from Simpson Springs.

Two types of insulators found at Simpson Springs could be identified from available documentary data. These are described by Shaffner (1867:539-540 and 545-546):

> *Among the improvements historic in telegraphing is the one called the brimstone insulator, represented by Figure 72a. Letter A is sulphur; B an iron arm to screw into the auger hold in the pole or tree. C is an iron pendant to support the wire in the eccentric hook D. E is an iron casing, and is a part of B. The flange below E was to prevent a watery connection in times of rain, dew, or fog. These insulators were extensively used on the early lines constructed by Messrs. Ezra Cornell, John J. Speed, Jr., and J. H. Wade of the northeast and northwest. This combination of materials proved to be very defective; and at an enormous expense they had to be removed from the lines and others substituted. The losses sustained by their use were very great, almost producing the ruin of some of the companies. The reader may be surprised to learn that it proved so seriously fatal, and he may be unable to comprehend why it was not found to be defective for telegraphic service before it had been so generally applied. The explanation will be readily understood when it is remembered that these various lines were all being built at the same time, in different directions, by different gentlemen, contending against rivals on the same routes. In the course of a few weeks, several hundreds of miles were constructed. It was but a short time before the fault of the nonworking of the lines was found to be in the application of the sulphur. The complete failure of these insulators has prevented others from attempting to use sulphur in connection with the insulation of telegraph lines in America.*
>
> *The insulator represented by Figure 72b is called Batchelder's hard rubber insulator. Hard india-rubber has been used for the insulation of telegraph wires for several years past, and has served successfully during the heat of summer and the extreme cold of winter. The seasons have not affected it. This substance does not soften at a lower temperature than 300°F.; it is much stronger than glass, it does not absorb moisture, nor does the dew collect upon its surface as readily as upon glass or porcelain. The figure represents the insulator in its full size. A is a wooden block, in which are the holes F, converging together toward the back, so that the spikes which pass through them are dovetailed to the post. The circular cavity B is about 2 inches in diameter and two inches in depth, within which the lower part of D-C is protected from rain and moisture. A hole is bored in the block the proper size for the reception of D-C. The hard rubber C covers the iron rod or pendant D, so that there can be no metallic or other conducting connection with the earth. The hard rubber cannot be broken from the iron other than by a hammer or some great force, greater than befalls a telegraph insulator. The line wire is laid in the hook D, which has its flanges at angles to hold the wire taut. This insulator has been very extensively used, and particularly in the northern states.*

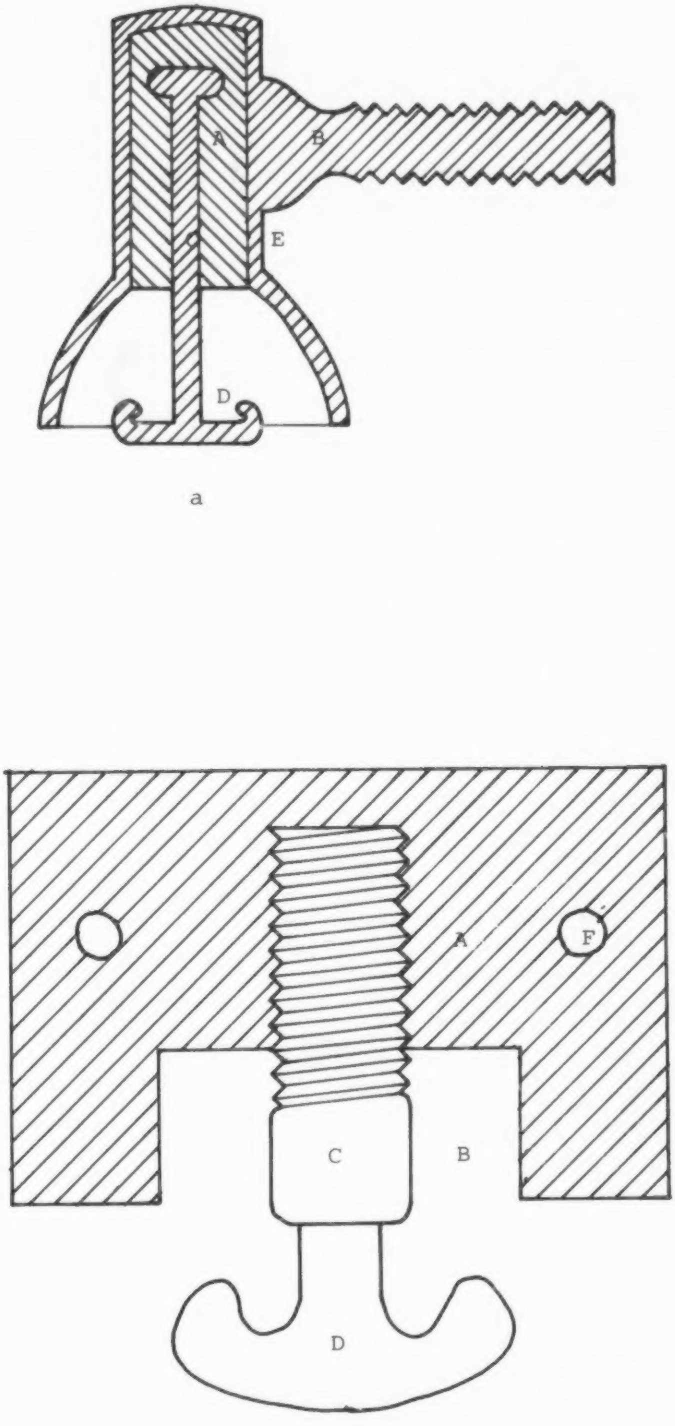

A
B
E
D
a
A
F
C
B
D
b

Figure 72.
Two "ramshorn" types of insulators
(after Shaffner 1967:539-546).

Tibbitts (1968:22) reports a ramshorn type insulator, marked "GOOD YEAR PATENT 1851," found in trees along the Overland Trail in Nevada. Compare also those illustrated in Tibbitts (1967:41-42) and Tibbitts (1969:100-101).

Three other fragments of insulators were recovered from the Simpson Springs excavation, these from Structure 2. One fragment (Figure 71a) is embossed . . .DDLE. The other two are simlar insulators with a flat top and straight sides (Figures 71b-c). The diameter of the top is 5.7 cm. All three fragments are aqua blue in color.

The fragment marked . . .DDLE did not have screw threads and probably was manufactured by Mulford and Biddle. This company made plain insulators and types marked with U.P.R.R. (Union Pacific Railroad), used for early telegraph lines (Tibbitts 1967:93). The lack of a threaded pin hole suggests a manufacture date before 1865. Compare the two known types in Hill and Pickett (1968:60), Schroeder (1971:47), Tibbitts (1967:93), Tibbitts (1969:84), and Milholland (1971:35).

CHAPTER 3

HISTORICAL CERAMICS

A total of 467 pieces of ceramics was unearthed at the Simpson Springs structures. The main types are (1) earthenware, (2) stoneware, and (3) porcelain. Practically all (400) of the sherds recovered came from Structure 4 (Table 4).

Notes on Historic Ceramics

The district of England that produced practically all the pottery shipped to the United States was Staffordshire. An important center of pottery manufacture in Staffordshire was Burslem, where many southwestern sherds originated. Mankowitz and Haggar (nd:40) describe Burslem as follows:

> *The first of the Potteries towns of North Staffordshire to rise to commercial importance as a center of pottery manufacture. In the seventeenth century, its potters were largely concerned with meeting the requirements of neighboring farms and dairies. Because of its extensive manufacture of butterpots, it became known as the butter pottery. Lead-glazed red wares were then the staple product. Presentation pieces were ornamented in slip with a contrasting color. Salt-glazed stoneware was made from about 1690, and red unglazed stoneware ("red china") from the time of Elers, when the Staffordshire potter began to meet the demands of the new habit of tea drinking. About 1710-1715 there were at least forty-three potworks in Burslem as against seven listed for Hanley and two at Stoke. These figures (based upon the memory of an old person) are valuable only as indicating the relative size and importance of the pottery towns and villages at the beginning of the eighteenth century.*
>
> *Wedgwood's list of Burslem potters in 1710-1715 contains many names which recur throughout the century: Wedgwood, Malkin, Adams, Shaw, Daniel, Warbuton and Lockett; he himself, before moving to Etruria, potted successfully in Burslem. The important factories in Burslem at the end of the eighteenth century were those of the Woods, particularly Enoch Wood, William Adams & Co., and Timothy and John Lockett.*
>
> *The construction of the canal led to the development of Burslem along the road to Wolstanton, hence arose Longport, Middleport and Newport which became important sub-centers of pottery activity. Davenport's factory which lasted nearly a century was at Longport.*
>
> *The opening years of the nineteenth century saw other firms emerging to eminence; Riley, Alcock and Davenport to compete with Enoch Wood. Doultons and Maddocks emerge at the close of the century. John Maddock & Sons was founded in 1830.*

Had it not been for the inquisitive mind of Josiah Wedgwood, the pottery industry of England might have stagnated, much as did the

TABLE 4

Summary of Ceramic Artifacts

	1	2	3	4	Trenches	Totals
Earthenware		1		16	1	18
Redware		1		14		15
Brownware				2	1	3
Stoneware		19	9	372	34	436
Ironstone		16		232	29	277
Pearlware		3	9	75	5	92
Transferware				22		22
Blue				4		4
Red				1		1
Green				13		13
Brown				4		4
Onglaze Polychrome				6		6
Decal				23		23
Peasantware				16		16
Flown Blue				16		16
Porcelain				10	3	13
TOTALS		20	9	400	38	467

American industry. Wedgwood was a product of the Industrial Revolution; its manufacturer always experimented to produce new wares, thereby creating a competitive atmosphere among potters.

The last half of the eighteenth century saw the development of the still-popular stoneware. Blacker (1926:45-46) states that

> *the nineteenth century produced but little of the green glazed buff ware, and little of delft ware and slip ware; moreover, the tortoise-shell, agate, marbled, and combed wares had disappeared, followed by the salt-glazed white stoneware. The brown-glazed red or drab ware (salt-glazed), the white and cream coloured earthenwares (lead-glazed, Rockingham, and jet ware) became prominent as the staple productions of many factories which only made ordinary earthen and stone ware.*

For the period after the War of 1812, Hodgson (1912:27-30) writes that

> *In 1820, ware decorated with American views was extensively made in Staffordshire potteries for the American market. This was at first decorated in a rich, deep shade of blue. The views included many American buildings and scenes, the landing of LaFayette, Arms of the United States, portraits of Washington, the Battle of Sebastapol, Biblical, and many other subjects, and were manufactured by Enoch Wood, Adams, Clews, Ridgway, Stubbs, Mayer, Rogers, Stevenson, and others.*
>
> *Later on, a series of English views, in deep blue, were used to decorate services for this country (England), and other colours were subsequently employed, those most frequently met with being pink and green, although medium blue, brown, and even mauve were used.*
>
> *The borders found with this style of decoration vary; sometimes flower or fern borders were employed; other pieces have a foliage design; whilst shells, seaweed, and conventional patterns were also used.*
>
> *On some pieces the name of the view will be found underneath, and the maker's name of the name of the pattern used as a border.*

In 1910, The Potteries became a parlimentary borough known as Stoke-on-Trent, which became a city of the same name in 1925.

The earliest historical pottery produced by the colonial people from Europe was earthenware (as described herein), made from natural-colored clay. This tradition changed but little up to the end of the eighteenth century. Beginning in 1800, a number of small potteries began producing more refined earthenware and possibly some stoneware. Usually the manufacturers of bricks also made pottery. Essentially, however, the only pottery made was Redware, made from local glacial clays, as were the common bricks (Watkins 1950a:5).

Spargo (1938a:114-115) describes an interesting custom of this time period:

> *It was the custom for men with an idle hour to spend to visit the local pottery to watch what is, after all, one of the most fascinating of all occupations. During such visits, it was a common thing for a man seeing a jug or other utensil, which pleased his fancy or seemed well adapted to some need of the moment, to order it and to mark it as his fancy dictated while the clay was still wet. And on cold or wet evenings the pottery was a gathering-place for young men especially when the kilns were burning ware. At such times, many a "green" piece was selected and marked. It might be a mug to be marked with the initials of the youth newly conscious of the need of shaving, a cider jug to be marked with the family name, or a pitcher to be inscribed with the name of mother, wife, or sweetheart, perhaps with a sentimental inscription in addition. Finally, many potteries advertised the fact that they would permit patrons to mark their wares.*

Practically all stoneware used by Americans before the nineteenth century was produced in the British potteries. Much of that sold to the American market consisted of the finer and more expensive goods. In 1765, one of Wedgwood's better markets was that of the Colonies (Spargo 1938a:64).

With the outbreak of the Revolutionary War, British pottery was no longer imported by the United States. The lack of such competition stimulated the American pottery industry. Many new potteries opened for business, now that the market was available.

However, this market was short-lived. Spargo (1938a:96-97) describes the events of this time as follows:

> *Emerging from the great struggle triumphant, a nation in name and aspiring to the realization of its meaning, the dominant note in the psychology of the people was an overwhelming national consciousness. The scene of national independence was not confined to politics; it overflowed political channels and spread over the whole area of life. Independence, and its corollary, self-sufficiency, sought expression in industry and commerce and in culture.*
>
> *There are two facts to be noted by the student of this phase of the development of American ceramics. The first is that the English manufacturers made desperate attempts to recover the important American market. The vast amount of transfer printed ware bearing the portraits of such leaders as Washington, Franklin, Jefferson, Hancock, and others, pictorial designs representing Americans triumphs in the Revolution, and mottos expressing American exultation and British humiliation, bear witness to the intensity of the new English competition.*
>
> *The other fact is that the return of peace brought important accessions to the productive force of the country. The pottery industry in particular was greatly strengthened.*

> *Among those who had served under the British regiments and those of the German auxiliaries, there were many skilled artisans, who elected to remain in this country rather than return to their own (Spargo 1938a:99).*

After the war the American people once again started buying English export pottery. There seemed to be a certain amount of prestige involved in using English pottery. For this reason, many American firms did not mark their pottery, and it could be sold as English by the retailer. Because of the return to foreign pottery, many of the newly developed firms collapsed from lack of support (Spargo 1938a: 100-101).

Up to the 1850s, the import of British fine wares left only the cheaper types for the American potter to manufacture, except for the brief period of the War of 1812.

By 1850, the British wares had lost their esthetic quality. Ramsay (1939:107) describes the British goods of this time as follows:

> *Bodies were heavier and coarser, and the current printed decorations no longer showed the rich deep blue, in large areas from deep-cut engraving, of the early printed ware, but thin and spindly designs in insipid pale blues, pinks, or greens and dull blacks, brown and purples. The American buyer was still catered to with local or historical subjects.*

Pottery that became popular about 1850 was the coarse, plain ironstone. This type of stoneware was known by many names, such as semi-porcelain, white granite, and stone china. It became immediately popular. A variety of ironstone called White Granite became the common tableware of Americans for the next 50 years. Simplicity of white granite solved many problems of manufacturing, since it was seldom decorated. Ramsay (1939:109) states that white granite "often shows a blue-white color," but those vessels studied that were labeled as "White Granite" looked like the regular white ironstone with no blue color. Another stoneware that became popular after 1850 was Parian.

Color-printed decorations did not become popular in the United States until after 1885, and then only on an improved body. This was Hotel Ware or Semi-Porcelain, made strong by the kaolin content (Ramsay 1939:109).

After 1883 a modified type of Parian which was very thin and lightly washed with a pearly metallic luster came into vogue. This variety of Parian, known as "Belleck," was introduced to the United States by Ott and Brewer, Trenton, New Jersey (Ramsay 1939:110).

The American pottery industry was ineffective in the nineteenth century. It was not until the formation of the American Ceramic Society in 1898 that the industry became an organized group and cooperated in improving American pottery.

Table 5 summarizes Ramsay's (1939) general outline of the various wares produced in the United States and the approximate dates of their manufacture. His final date of 1900 was the cutoff date of his research; he does not discuss wares made after that date. Those dates with a plus after them indicate that the particular ware in consideration was probably still being manufactured after 1900.

TABLE 5

Dates of American Manufacture of Historical Ceramics prior to 1900 (Ramsay 1939)

Earthenware

A.	Redware	
1.	Unglazed	1725-1900+
2.	Unglazed interior/lead glaze exterior	1750-1900+
3.	Unglazed interior/salt glaze exterior	1825-1850
4.	Glazed interior/unglazed exterior	1750-1900+
5.	Lead glazed interior/unglazed exterior	1825-1885
6.	Lead glazed, or Albany slip interior/salt glazed exterior	1850-1880
7.	Lead glazed interior and exterior (uncolored glaze)	1750-1900+
8.	Lead glazed interior and exterior (daubs of manganese brown)	1700-1900+
9.	Brown lead glazed exterior and interior (daubs of manganese)	1775-1900+
10.	Black or dark brown lead glaze exterior and interior	1750-1900+
11.	Green or mottled green lead glazed exterior usually clear lead glaze interior	1750-1900+
12.	Lead glazed interior and exterior with clear brown-black glazes with mica flakes	1800-1875
13.	Decorated in relief with applied modeled motifs	1820-1900+
14.	Dolls, figures, toys, etc.	1750-1900+
15.	Molded or pressed in imitation of Bennington, Staffordshire or other pottery	1800-1900+
16.	Buff slip (or cream) interior and exterior with clear lead glaze	1825-1875
17.	Buff slip marbled with red-brown under or added to lead glaze	1825-1900+
18.	Manganese tan dull glaze with sepia brown daubs of manganese	1850-1890
19.	Rough cream slip exterior/no glaze or coating interior	1860-1900+
20.	As above with daubs of copper-green lead glaze	1860-1900+
21.	Slip decorated with underglaze designs of parallel straight or waved line and dots in yellow cream slip tinted by glaze	1750-1875

B. Yellowware

1. Plain	1830-1900+
2. Decorated with lines or bands of white, blue, black or brown	1830-1900+
3. Heavy coarse pale buff body	1850-1870
4. Pressed or cast in molds in decorative forms	1830-1900+

C. Brownware

1. Unglazed	1840-1875
2. Plain brown glazes	1830-1900+
3. Plain brown glaze with colored bands or ornaments	1850-1900+
4. Salt glazed over Albany slip	1860-1900+
5. Alkaline or leadless glazes (clear)	1860-1900+
6. Black or brown-black high glazes	1850-1900+
7. Dolls, toys, whistles, banks, etc.	1830-1900+
8. Rockingham brownwares, or Bennington with mottled lead glaze, pressed in molds	1830-1900+
9. Rockingham brownwares mottled in light brown or cream	1850-1900+
10. "Blue Rockingham," molded or pressed mottled blue or blue-black glaze	1840-1870
11. Flint enamel brown type, finely mottled in multi-colors suspended in the glaze	1850-1880
12. Combed brown type, covered with dark slip--combed in wavy lines to show lighted body	1850-1860
13. Scroddled brown type, marbled effect	1845-1875
14. Marbled slips	1850-1857
15. Door knobs and drawer pulls	1840-1900+

D. Grayware

1. Plain	1750-1900+
2. Plain, glazed interior with Albany slip (glaze) in brown, before salt glazing	1800-1900+
3. Decorated in cobalt blue (figures, dates, names or initials, scrolls, flowers, birds, animals and human figures)	1790-1900+
4. Stenciled designs in cobalt blue (simple figures or makers' names to elaborate designs)	1840-1900+
5. Dark blue-gray shade with freehand designs in purple-blue	1850-1890
6. Freehand designs in manganese brown	1850-1890
7. Incised decoration	1790-1900+
8. Applied relief decoration	1825-1875
9. Pressed in molds, often with blue decoration	1825-1900+
10. Dolls, toys, whistles, banks, etc.	1790-1800

Stoneware

1. Cream colored (coarse body, cream or pale buff in tint)	1850-1900+
2. Cream colored Queen's ware	Attempted in 1850
3. White--pure white with hard alkaline glaze	1880-
4. Overglaze	ca. 1880+
5. Overglaze with metallic luster	Not in America
6. Decorated underglaze by hand	All periods
7. Decorated underglaze by printed designs	1900+
8. White or colored glazes with tin	Never made in U.S.
9. Majolica (on hard whiteware body)	1875-1900+
10. Pressed or cast in molds with relief designs	All periods
11. Relief designs separately pressed and applied before burning	Not used in U.S.
12. Ironstone	Not in America prior to 1900
13. White Granite (greater hardness and density)	1860-1900+
14. Semi-Porcelain (Hotel ware)	ca. 1880+
15. Unglazed Jasper type	Not in America
16. Salt glazed	Not in America
17. Parian	1848-1875
18. Belleck	1883-

Porcelain

1. Hard porcelain	1880-
2. Frit type	Not in America
3. Bone type	Not in America

Note: Archaeological evidence may change this information considerably.

General Ceramic Chronology

1531 - City of Puebla founded

1550 - Talavera potters highly skilled

- Majolica made in Puebla, Mexico, and Mexico City

- Tin enameled earthenware had its beginnings

1575 - Beginning of Moresque influence on Mexican majolica

1600 - Beginning of Spanish influence on Mexican majolica

1650 - Beginning of Chinese style of Mexican majolica

1653 - Potters' guild established in Mexico

1690 - Salt glazed stoneware

1700 - Decline of Moresque style influences of Mexican majolica

1715 - Some Burslem potters include Wedgwood, Malking, Adams, Shaw, Daniel, Warburton and Lockett

1720 - Cream colored ceramics introduced

1752 - Transfer printing introduced

1765 - The Colonies one of Wedgwood's best markets

1766 - Basalt ware refined

1770 - Tan colored fine-grained stoneware introduced

1774 - Jasperware perfected

1779 - Pearlware introduced

1780 - Decline of Spanish style influence on Mexican majolica

- Willow pattern introduced in England

1790 - Lustered earthenware made by the Potteries

1800 - Bone China introduced

- A number of small British potteries began producing more refined earthenware and possibly some whiteware

best copy available

- Decline of Chinese styles influence on Mexican majolica

- Beginning of Pueblan or native styles on Mexican majolica

- Patent granted for "Stone China"

1810 - Peasantware pattern names used after this date

1813 - Ironstone being made

1825 - First transfer printed vessels produced in United States

1828 - Transfer prints in polychrome

1930 - John Maddock & Sons founded

- Rockingham ware produced

1837 - Lion and unicorn face observer prior to this date--often they face arms

1840 - After this date, oval garter used on some English hallmarks

1843 - Albany slip used

1848 - Multiple transfers used

1850 - British wares lost quality and became heavier and coarser

- Parian stoneware became popular

1860 - Decline of Pueblan style Mexican majolica

- Paper decals used (decalcomania)

1862 - "Trade mark" used after this date

c.1870- Flown-blue very popular (brown, green and yellow date from c. 1840)

1880 - Word 'Limited' used more after this date

1883 - Belleck introduced by Ott and Brewer, Trenton

1885 - Color printed decorations became popular in America

1891 - "England" added to hallmarks

1898 - American Ceramic Society established

1900 - Ironstone becoming more delicate

- Little hard-paste porcelain produced before this date
- "Made in England" used in 20th century

Chinese History

The Chinese traditionally date the invention of pottery to the reign of Hoang-ti, in the year 2698 B.C., and porcelain to the Han dynasty (185-80 B.C.) (Chaffers 1926:605-606). The period of interest when Chinese porcelain was exported to the United States falls in the Ch'ing Dynasty (A.D. 1644-1912), also known as the Manchu Dynasty.

The beginning of the Ch'ing Dynasty is a continuation of the ceramic art of the Ming Dynasty (A.D. 1368-1644), but the second emperor of the Ch'ing Dynasty perfected the art of ceramics in China (Chaffers 1926:637). The K'ang Hsi period (1662-1722) is distinguished by fine flowing lines and Ming decorations. The more important developments are famille verte, famille noir (black background), and Sang-de-boeuf (glowing copper-red glaze). The best blue and white porcelain was attained during this period, using native cobalt in many designs.

During the Yung Cheng period (A.D. 1723-1735) colors became paler and rose pink and ruby enamels were developed. Barber (1910: 10-11) describes the Ch'ien-lung period (A.D. 1736-1795) as follows:

> *The porcelain of this period is characterized by the exquisite whiteness of the paste, perfect technique, elegance of shapes, delicacy and symmetry of decoration, and the development of several new colors and styles of decoration. The pieces are, as a rule, most carefully potted and exquisitely painted. The transmutation, of flambe, glazes flourished in great variety and abundance. The coral red is more prominent and greatly improved over that of the preceding reigns. Crackled glazes were produced at will and reached their highest degree of perfection. Overglaze carmine and pink enamels, derived from gold, predominated in the paintings--a style of decoration which has been called the famille rose, by Jacquemart. In this reign the rice-grain and highly valued "Lace Bowls" are believed to have been first produced, since no earlier marks have been found upon them than those of this period. The "tea dust" and "iron rust" glazes were also developed.*
>
> *It was during the latter part of the Ch'ien-lung reign that the coarse heraldic and so-called "Lowestoft" porcelains, with undulatory or irregular surface, were produced in vast quantities for the European and American markets.*

Trade to foreign countries reached their climax between 1760 and 1780, and by 1800 they had almost ceased (Du Boulay 1963:110). The potteries of Staffordshire had begun to produce great quantities of porcelain. About 1800 there was a shift from the European market to the American market, and many American motifs were used on Chinese pottery. Decadence in Chinese porcelain set in and quality began to decline about 1800. During the reign of Tao Kuang (A.D. 1821-1850) the body became a chalky white and thin, while the glaze had an oily sheen and muslin-like tone (Jenyns n.d.:72). In the reign of Chia Ch'ing (A.D. 1796-1821) iron red dominated the market and later became a purplish red.

During the nineteenth century there was great civil strife in China, and the royal potteries fell into disuse or were little cared for. Porcelain with a Hsien Feng (A.D. 1851-1861) mark is very rare. From this reign onwards Chinese royal marks are in red (Jenyns nd:73).

Ceramics From Simpson Springs

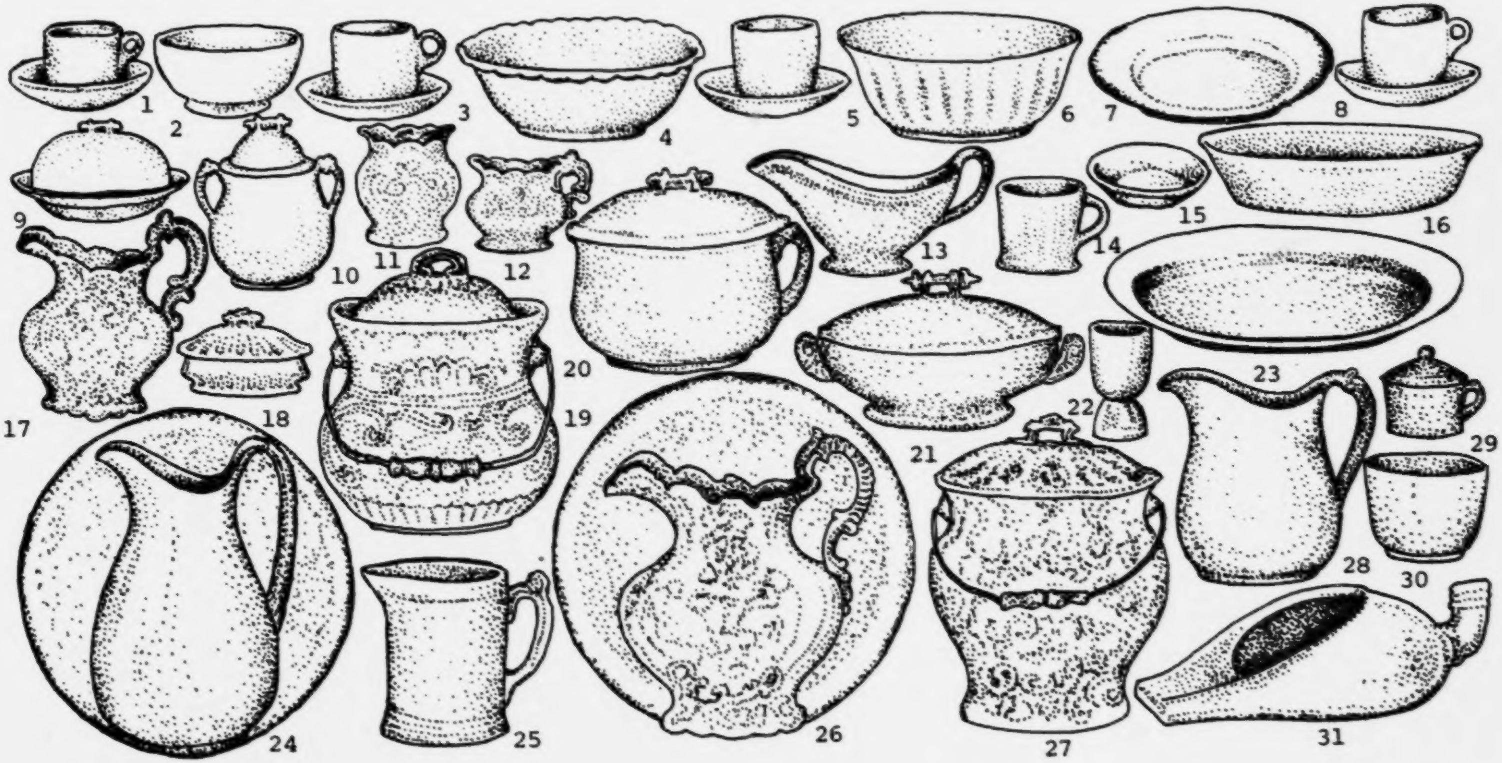
The division of historical ceramics into earthenware, stoneware, and porcelain is based on the body or paste type, glaze characteristics, and decorative techniques. These criteria were used simply because they provide the best distinctive separations of the ceramics into general wares. Form could not be used as a classifying criterion because shapes are fairly standard, and all types are utilized as table services in the form of plates, cups, saucers, etc.; or household items such as pots, pans, storage vessels, utensils, etc. More important, however, is that vessel form does not help one to understand sherds from fragmented vessels. If we had all whole vessels with which to work, we could devise a far more useful classification of pottery based on shape than we could one based on paste, glaze, or decoration. But the fact remains that we most often find small fragments of pottery and not the whole vessel. We therefore need a type of classification that can handle both the whole vessel and the fragments.

The vessel forms of ironstone include, among others, dinner settings for the table, cooking vessels, chamber pots, tea services, and ornaments (see Figure 73 for various shapes of ceramic vessels). One small piece of ironstone would not be an accurate indication of which of these forms it was used for.

On the other hand, paste, glaze, and decoration provide well defined characteristics from which to determine separate ceramic wares and types. Paste is distinctive for the identification of certain types of earthenware. Factors involved in paste separation are color, texture, translucence, vitrification and composition. Composition has been used very little, since this would involve numerous thin sections and clay samples in order to establish the mineral matter of a particular clay. Once the composition of the clay employed by a factory or in an area is determined, the excavated sherds would then have to be compared with the composition determined by petrographic analysis to establish points of origin.

Earthenware

Earthenware consists of those vessels whose bodies are opaque, non-vitreous, and porous and which require a glaze for domestic use (Hughes 1956:69). In this class of pottery are included the natural-colored pastes. It is defined by Ramsay (1939:152) as being an "opaque, non-vitreous, and more or less porous clay ware," but it does not include those wares with pure white bodies. Stoneware is not earthenware, due to its general lack of porosity. Earthenware is subdivided into two classes based on body hardness, or porosity. These two types are soft pastes and hard pastes.



1. Baltimore handled cup
2. Oyster bowl
3. St. Denis coffee
4. Scalloped nappy
5. St. Denis unhandled tea
6. Fluted nappy
7. Plate
8. St. Denis tea
9. Covered butter
10. Covered sugar
11. Vase
12. Vase
13. Sauce boat
14. Shaving cup
15. Fruit dish
16. Baker
17. Mouth ewer
18. Covered soap
19. Plain combinet
20. Cable covered chamber
21. Covered dish
22. Double egg cup
23. Platter
24. Cable ewer and basin
25. Hall boy mug
26. Fancy ewer and basin
27. Fancy combinet
28. Jug
29. Handled mustard
30. St. Denis bowl
31. French bedpan

Figure 73.
Vessel shapes and types of Homer Laughlin pottery (after Butler Brothers Catalogue 1915).

Soft Paste Earthenware

Soft paste earthenwares are very porous and generally rough to the touch on the fractured edge. They have poor heat resistance and can be glazed or unglazed.

Redware. The clay used in Redware is often the same as that used for the common red brick. Fired at approximately 1700° Fahrenheit, it becomes a red-brown color with a relatively soft and porous paste. When touched by the tongue it will stick to the paste due to its high porosity. Increased firing temperature produces a burnt-red body color, while an orange color is obtained at lower temperatures (Ramsay 1939:8). Redware may have a lead glaze of dark brown to black and may be decorated with streaks, spots, or speckles without specific pattern. At times an Albany slip or salt glaze is found on this type, but more often colored enamels are used. In addition to the glaze, decoration may be accomplished by incising in the soft clay, or even by tracing a design in light colored clay on the natural red body (Ramsay 1939:15). Redware, the earliest type of American pottery, rarely has a maker's mark.

Simpson Springs Redware: The sherds of this type from Structure 4 were glued together to partially reconstruct a crockery jug. The outside of the brick-red jug was glazed dark brown. Height: 5.125+ Width: 5.25+ Provenience: Structure 4 (Figure 74a).

Other types of soft-paste earthenware found in historic sites in the west are the following.

Slipped ware. The distinguishing feature of this type is the surface treatment. It has not been glazed, but rather a colored slip has been applied to either the exterior or interior or both surfaces.

Geoffrey Bemrose (nd:9-11) states that

> *A belated use of slip--the potter's term for clay watered to a creamy consistency--made its appearance early in the century (17th) usually for the decoration of jugs, ale mugs and other domestic utensils. By its very nature, slip requires to be trailed or drawn-on to the pottery and in the late seventeenth and early eighteenth century some magnificent trailed slipware was produced by Toft, Simpson and others. The nineteenth century potter used slip in various ways, two of which were new--firstly by combining two bands of contrasting colour into a motif and secondly, by trailing two colours side and by and then working them together either by a brush or the finger. Slip banding also appears on nineteeth century wares.*

Biscuit ware. Included in this type of ware are all those vessels that have had an initial firing but lack glazing, enamelling, slipping, or any other variety of surface covering. Biscuit ware is decorated by means such as incising, modeling, molding, and so forth, or with pressed designs from a stamp.

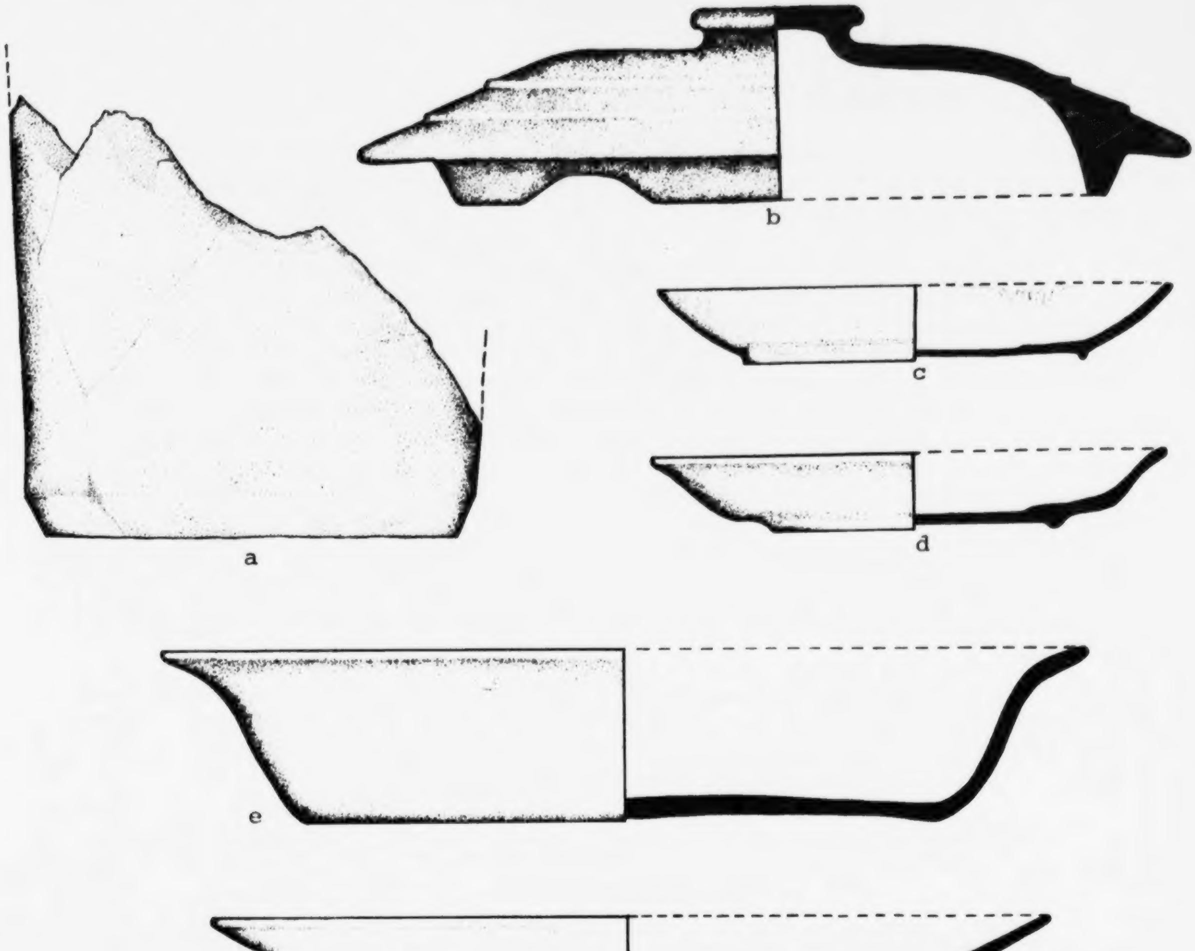


Figure 74.
Earthenware and Stoneware ceramics.

Tortoiseshell ware. Hughes (1956:148) states that this type is

> *earthenware decorated in imitation of the shell of a tortoise at a period when this was a favourite form of somewhat stylized ornament in various media. Metallic oxides were dusted on the lead-glazed surface of the ware before the glaze was fired--manganese to give madder brown, bronze and purple; copper for green; iron for orange and yellow; cobalt for blue. When fired the mingling colours produced markings in a wide range of variegated tints, the more usual combinations being mottle green and brownish grey; brown, green and slate-blue; mottled grey, green, slate-blue and yellow.*

Thomas Whieldon was known to have used this type of pottery for knife hafts, among other things (Hodgson 1912:22). The type, extensively manufactured and used, was very popular, so it may eventually be recovered from sites in the west.

Luster ware. Bemrose (nd:13-15) states:

> *In England the application of thin films of metal to pottery was due to the researches of Josiah Wedgwood. Probably as early as 1775 he was engaged in experimental work, evidently with the idea of imitating Near Eastern and Italian true lustres. From notes in the Wedgwood Museum at Barlaston it seems likely that he received assistance from his fellow members of the Royal Society but it is certain that other potters were engaged in the same task. Whatever the facts, it is evident that by 1790 or thereabouts some lustred earthenware was being made in the Potteries and by 1800 the production was considerable.*
>
> *Broadly considered there are six classes of English lustre: 1. plain (either "gold," "silver," or copper), 2. painted, 3. resist, 4. printed and banded in lustre, 5. moulded in relief, and 6. stenciled. Various combinations are known, such as blue prints with silver lustre embellishments and printed wares to which lustre painting has been added. Coloured grounds including the prized canary-yellow and a subtle apricot-buff are excellent. In the earlier specimens the body-material was usually creamware; white earthenware also was used frequently, we find lustre on bone-china bodies. The makers were men, though few pieces are marked.*
>
> *The homely lustre which continued almost to our own day was usually on a red body. Much of it was made for sale at country fairs.*

Mottled ware. This type has a characteristic surface treatment in which the exterior glaze is covered with splotches, streaks or specks of light and dark shades of the same color or various colors. The interior may or may not be mottled.

Mexican Majolica ware. The beginnings of ceramic manufacture as a fine art in Spain were initiated with the establishment of Arab rule in A.D. 1232 (Caywood 1950:79). The tin enamelled earthenware, known as Hispano-Moresque pottery, had its greatest impact on Spanish culture between the fourteenth and eighteenth centuries. Characteristic features of the Hispano-Moresque pottery are arabesques (designs in Moorish architecture), stylized animals and Near Eastern inscriptions. Enamelled faience was produced extensively in Malaga, Valencia, Seville and Talavera, having been made (in Spain) first at Malaga. The Moorish influence was felt more in Malaga and Valencia, since Talavera was situated inland and was therefore less accessible to contact. The metallic luster of the Moresque style are absent in early Talavera pottery. Talavera pottery reflects more the style of Italian majolica, since more contact was maintained with Italy than with the Moors, and it was isolated from the influence of Malaga and Valencia. Italian influence on Talavera pottery, particularly that of Savona and Genoa, is strongly seen during the seventeenth century.

Typical Malaga majolica was decorated with "golden and pearly lustres combined with dark blue decorations in conventionalized animal and plant forms" (Barber 1908:38). Valencia became an important center of majolica manufacture in the fifteenth and sixteenth centuries. This pottery was decorated with animals and plant forms also, but Valencian majolica has motifs that are small, crowded and often heraldic (proclaiming sovereigns, state leaders, etc.), while Malaga majolica motifs are large and bold.

By the 1550s Talavera potters had already become highly skilled (Barber 1915a:7), and it was during this time period that Dominican friars with the knowledge of glazing and pottery-making were sent from Talavera to New Spain, specifically to Puebla (Caywood 1950:80). Thus was established in Puebla, the city having been founded by the Spaniards in 1531, the craft of making majolica in the Spanish tradition.

Majolica found in sites that date before 1550 would almost certainly have to be of Spanish manufacture. Spanish majolica was painted in delicate and precise patterns with saints, heads of cherubs (a winged heavenly being), horses and chariots, figures of squirrels, boars, bulls and hares as predominant motifs (Barber 1915b:6-7). Mexican majolica, on the other hand, is, as Barber (1915b:6) states, "thick and viscid, standing out in perceptible relief"; and tiles and vessels "were painted in a vigorous and bold style, . . . usually coarse and heavy, and frequently clumsy in modeling." Italian majolica differs from Mexican majolica in that the former has a superficial coating of lead-oxide glaze (known as marzacatto), while in Mexican majolica the lead is mixed with the glaze, giving the vessel surface a hard and homogeneous enamel (Barber 1908:34). Lustering was never attempted by the Pueblan potters, which draws closer their ties with Talavera and Seville.

In 1653 a potters' guild was established to regulate the manufacture and sale of pottery. Some of these laws, as quoted by Barber (1908: 19-21), are paraphrased as follows: three classes of pottery were made--fine, common and yellow; the clay had to sifted and cleaned; the glaze properly mixed and treated; the glaze differed in proportions for common pottery as to that of fine pottery; table plates should be one-fourth border, no thicker than a real and of equal thickness; and finally, but important for dating specimens, each master potter had to mark clearly every vessel with his stamp or trademark (Barber 1911:6). Although little or nothing has been published on the subject, majolica was also made in Mexico City by the 1550s, and possibly earlier.

Majolica has an absorbent white or red paste. These two paste colors, and no others, occur from the beginning of Puebla majolica manufacturing up to the present day. The paste color is a variant that depends on the firing temperature and duration. The red paste, because it is fired hotter and longer, is harder than the white paste (Barber 1908:34). Apparently neither the white nor the red clay was used alone, and the combination of the two produced varying shades of white through brick-red pastes.

The opaque enamel (or glaze) applied to the surface of vessels produced a dense white base upon which the basic colors could be added, before firing. This firing fuses the white enamel and the inglaze design. The hardness of the glaze depends on the amount of tin employed in the mixture--the more tin, the harder the glaze (Barber 1915b:5). Designs were hand-painted in dark blue (commonly called cobalt blue) from the initial production to the present, and other colors--yellow, green, brown and black--were used possibly from the middle of the seventeenth century. Nevertheless, polychrome majolica is rare in the middle of the seventeenth century. Polychrome colors became diagnostic of majolica in the early nineteenth century. In 1653 the potters' guild ruled that only the fine vessels could be decorated in five colors, while the cheaper pieces were to be decorated in three colors (Barber 1908:14).

Barber (1908, 1911, 1915a, and 1915b) and Caywood (1950) have defined four different decorative styles of Mexican majolica. These styles overlap in time; and during the period when most foreign influence showed itself on Mexican majolica, 1650-1750, the art reached its climax (Table 6). During this time numerous potteries produced this ware. The four styles, defined by their foreign influence are (1) Moresque style, (2) Spanish style, (3) Chinese style, and (4) Puebla style.

1. Moresque style (1575-1700). The Dominican friars who taught the native potters of Puebla brought with them the styles of Talavera, which at the time were still under the influence of the Moors. The distinguishing features of this variety are interlacing scrollwork and strapwork. These designs can be in heavy raised blue enamel, outlined in black.

Another influence seen in work of the first pupils of the friars are Aztec motifs, which are often combined with the Moresque and Spanish styles (Barber 1915b:14).

A common motif of the Moresque style is the round-dome mosque typical of the Mohammedan religion.

The expulsion of the Moors from Spain in 1492 caused a decrease in Islamic motifs, and by 1700 this influence had ceased in Puebla. The decline in the Moresque style may have been brought about by the gradual elimination of the original instructors and pupils through natural or other causes, and by the gradual application of new styles introduced by new Spanish instructors to new pupils.

2. Spanish style (ca. 1600-1780). Also with the expulsion of the Moors, Spanish art began to take on a form of its own. After 700 years of Moorish dominance, however, the expression took time to develop. Spanish characteristics can be seen in motifs such as animals, birds and human forms, and in vessel forms such as urn-shaped jardinieres, albarelli (apothecary jars), and barrel-shaped flower jars. This style is also known as Talavera, because during the seventeenth century Italian potters went to Spain, where they introduced new methods of modeling and painting (Barber 1915b:7), which in turn made themselves felt in New Spain. Birds, animals, and figures of saints as decorative motifs dominate this variation of the Spanish style (Barber 1911:7).

Three distinct styles of painted decoration are recognized as the result of Spanish influence: (1) tatoo (intaglio), (2) silhouette (relief), and (3) outline (surface). The tatoo style of decoration is the filling in of spaces with large blue dots depressed beneath the vessel surface (Barber 1915b:8). The design outline was pressed into the initial raw glaze, guided by a pale blue outline. In the silhouette method the glaze was applied thick enough to make the glaze stand out above the surface after firing. It appears that the silhouette method was used on vessel forms of the Spanish style only. The outline treatment of design motifs was in imitation of Chinese painting. Designs were painted level with the surface in varying shades of blue, and figures were traced in a thin pale blue line. The design was then filled in by the tatoo or silhouette method (Barber 1915b:9).

Speaking of the Spanish style, Barber (1908:56) states: "One of the most characteristic styles of decoration, found frequently on albarelli and spherical jars, is that in which birds, flowers and conventional devices are boldly but rudely painted in silhouette, or solid, raised dark blue, almost entirely covering the white surface."

3. Chinese style (1650-1800). With the establishment of trade between the Spanish colonies of the Philippines and New Spain, Chinese design elements and shapes came to be felt by the native potters of Puebla as early as 1650 or earlier (Caywood 1950:83; Barber 1908:59). Spanish galleons sailing from the Orient brought Chinese porcelain to the port of Acapulco. The Chinese spherical jar-shaped vase with a bell-shaped cover was extensively copied by the Puebla potters. In this form are many vessels with iron lids secured with a lock and key, a distinctly Chinese feature. Characteristic of the imitation of Chinese blue and white porcelain is the use of flat colors of different shades.

Barber (1908:61) has defined four distinct Chinese styles of decorative work that may reflect different factories:

(1) Blue ground/white reserve designs. In this decorative style the details of the design are outlined in pale blue, after which the

background is filled with thick blue glaze, leaving the design reserved in white.

(2) Chinese figures. Typical of the figures used by the Chinese potters is a blue figure with Chinese physical features and dress on a white background. These blue figures are often outlined in dark brown, a further reflection of the Chinese style.

(3) European figures/oriental motifs. Porcelain with this type of decoration is sometimes known as "Lowestoft," or "Heraldic" China, in which the Chinese potter copied European designs for the foreign market. The European figures have been painted in the style of the oriental artist. This style of decoration is a Pueblan copy of oriental Lowestoft.

(4) Open medallions. These open medallions of ornate shape were decorated with floral designs and surrounded by conventional blue background decoration.

Frequently a combination of these varieties of decoration is found together. There are also Chinese-shaped vessels with Spanish designs. By the end of the eighteenth century the pseudo-Chinese style had completely disappeared, and simultaneously the Spanish conquerors were losing their control of New Spain.

4. Pueblan style (1800-1860). With Mexico obtaining her independence from Spain there were no longer the exacting rules of pottery making in Puebla. The potter could freely express himself, and this is exactly what he did from the beginning of the nineteenth century. The expulsion of Spanish rule also meant the expulsion of the friars who maintained control over the Pueblan potters. This unchecked freedom caused the decline of the majolica industry in Mexico (Barber 1915b:17).

The Pueblan style, or Hispano-Mexican decorative style, is characterized by extensive use of polychrome decoration. This decoration was done in green, brown, purples, and yellows (Barber 1908:71). In developing a style of their own the Mexican potters employed the colors of blue, green, yellow, red, brown, and black. With the disappearance of the Chinese influence, figure painting became gaudy. Later other tints were added, like mauve, or purplish rose, possibly in imitation of the English mulberry color. Many of the early traditional forms were still produced, and in addition many household and toilet articles were added, often inartistic in design.

By the end of this period, about 1860, vessel decoration was gaudy and crude, and pottery was over-decorated. From 1860 onwards popular styles included hideous heads and grotesque figures. At the same time many pieces were painted with a pale, grayish blue background.

Churches and dwellings of the wealthier classes were frequently embellished with the majolica tiles, or azuelos. Facades of churches and convents were decorated with friezes and panels of majolica tile, as were domes, wall mosaics, lavatories, and baptismal and holy-water fonts. The apartments of the rich were decorated with panels of tile-work with figures of saints, coats of arms, and inscriptions. Cemeteries were also ornamented with tiles which were often painted with figures of saints (Barber 1911:8-10).

In summary, the majolica industry of Puebla can be divided into three periods. The early period (1550-1650) was a time of developmental techniques and design. At the beginning there was a strong Hispano-Moresque influence from Talavera, Spain. Spanish motifs gradually came to predominate, with Chinese elements beginning to be effected toward the end of the early period.

The middle period (1650-1750) is that of highest artistic achievement by the Pueblan potters. The Moresque style of art died out midway through the period. The middle period was the climax of the Pueblan art of pottery making.

The late period (1750-1860) is characterized by a marked decadence in style. Spanish influence ceases about 1780 and the Chinese influence dies out about 1800, making the new gaudy pottery strictly Pueblan. Up to this time decoration had been almost entirely blue on a white background, or a negative white design with a blue background. Polychrome colors, though introduced about 1650, were little used until the 1800s. The late period is markedly distinguished by the use of polychrome decoration.

The modern styles have changed little since 1850-60, except for individual tastes. The pottery is elaborately decorated while designs cover the whole vessel, leaving little background area. More recently the many early design elements have been placed on white kaolin bodies.

Delft ware. Lewis (1956) describes this type as follows:

> *Tin enameled earthenware, or delft ware as it is often called, is an earthenware covered with an opaque whitish glaze made from oxide of tin. It was made in Syria, Asia Minor and Egypt as early as the sixth century A.D. It was first made in Europe by the Moors in Spain, then by the Italians. This technique finally arrived in England, by way of the Netherlands, in the mid-sixteenth century. The main centres of production in this country were London, Bristol and Liverpool.*
>
> *The earliest English delft pieces were jugs, mottled with various colours, and similar in shape to the German stoneware that was imported into this country at that time. These early jugs were sometimes mounted in silver, which was hallmarked, and so the pieces are dated, some as early as 1550.*
>
> *Chinese porcelain was being imported into England by the mid-seventeenth century, but it was extremely expensive and only within the reach of the rich. The delft ware of the English potters of this period was an attempt to provide the*

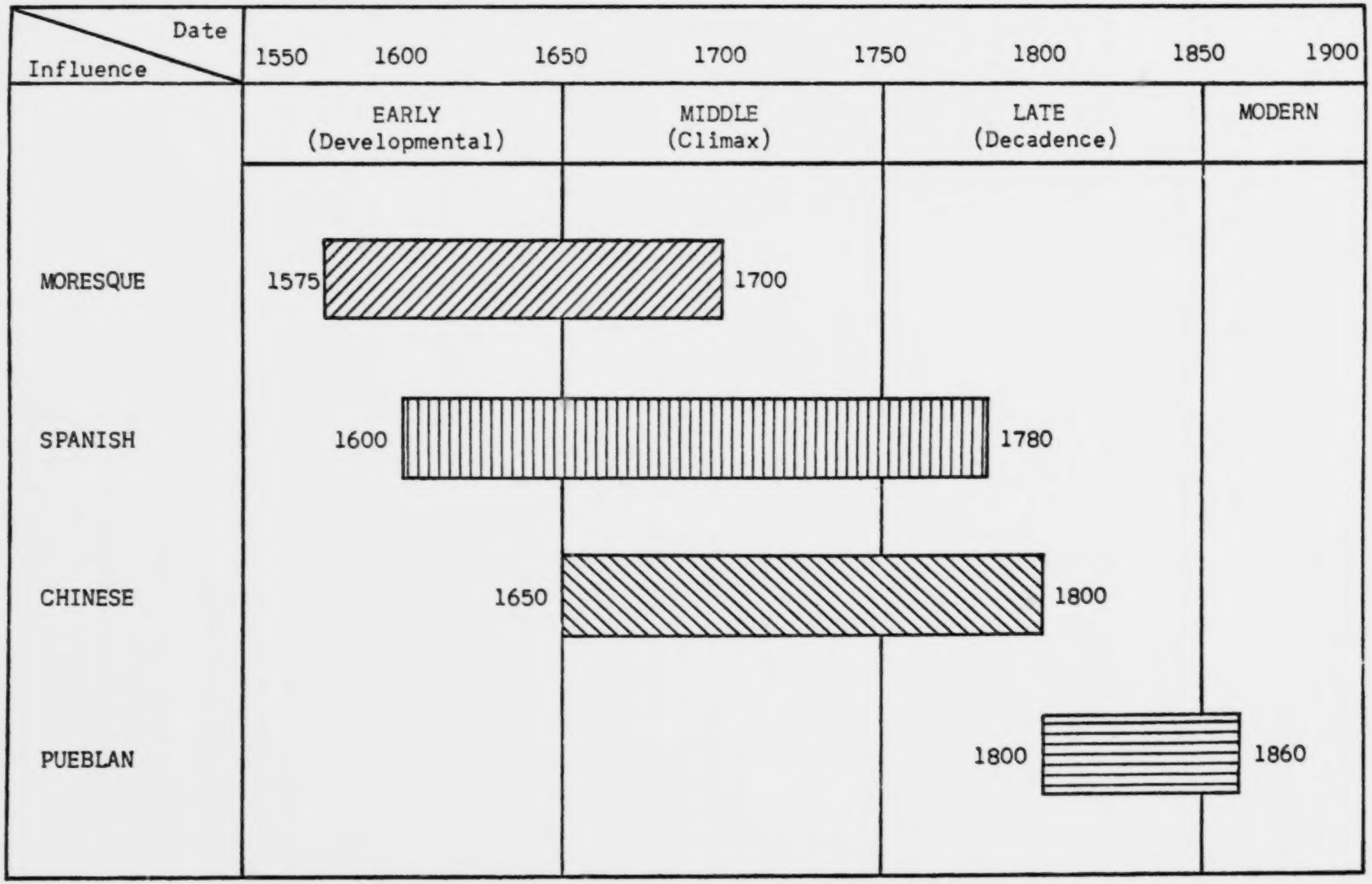


Table 6. Foreign influences on Mexican Majolica.

> *middle classes who could not afford Chinese porcelain, with the best imitation that they were able to make, for although delft ware was often thick and always completely opaque, it certainly bore a superficial resemblance to Chinese porcelain.*

Hard-Paste Earthenware

The earthenware that has hard-paste is that which is only slightly absorbent though not readily so. The paste is more vitreous than soft-paste, but it is also opaque. It may not require a glaze for limited domestic use. Hard-paste vessels are well fired and very hard.

Brownware. Within this type of earthenware are included those vessels which have a dark brown glaze, usually on both exterior and interior walls. The body pastes range from a reddish to a cream color. Those vessels with a cream-colored body are almost always ornamental pieces that were pressed into molds while in a plastic state (Ramsay 1939:20).

Brownware is transitional between redware and stoneware in that it is clay of a finer texture than the former and less dense or vitreous than stoneware. Redware sherds may have a brown glaze, but the paste determines the classification, since that of Redware is porous and that of Brownware is dense or slightly porous.

Brownware crockery is found in abundance in 19th century sites. Most authors do not include crockery with a brown glaze within this type because they do not vary enough to exclude it from Brownware. Brownware crockery comes chiefly in the form of jugs and crocks, but most likely other forms were manufactured.

Simpson Springs Brownware: From Structure 4 two crock lids of Brownware were unearthed. One had a "2" embossed on the lid handle, indicating that it was originally the top to a two-gallon container. Crock lid: Diameter: 9.75 inches; Height 2.25 inches; Provenience: Structure 4 (Figure 74b).

Other types of hard-paste earthenware which may be found at historic sites in the West are:

Yellowware. This type of pottery is defined on the basis of paste color and glaze effect. The paste is buff and fires very hard. As a result of the firing it is only slightly porous. This porosity varies, however, as does the hardness of the paste. The surface is treated with a clear glaze; and on firing, the color of the vessel walls appears a buff-yellow. The buff color of the body is intensified by the clear or alkaline glaze (Ramsay 1939:23).

This type of pottery seems to be a transition between Redware and cream-colored stoneware. The Yellowware body is finer than red-pasted pottery but coarser than stoneware. Yellowware was usually made in the same factories that produced the Rockingham variety of Brown Earthenware. However, some factories like that at Bennington, Vermont, made little or no Yellowware, while others, like the factories of Trenton, New Jersey, specialized in this type. This type is rarely hallmarked and is made only for utilitarian objects (Ramsay 1939:148).

Rockinghamware. Rockingham was reproduced in quantity from molds and covered with a lead oxide glaze that produced a metallic luster finish. Often these glazes contained manganese or iron salts, which produced a dark brown mottling (Ramsay 1939:21). This ware is fairly thin and fine. Earthenware of this variety was produced from about 1830 in New Jersey; Bennington, Vermont; Pittsburgh, Pennsylvania; Baltimore, Maryland; East Liverpool, Ohio; and in other places (Ramsay 1939:143). It is rarely marked. When colors are added to the basic Rockingham glaze, the pottery is called "Flint Enamel Ware" (Spargo 1938b:15).

Grayware. While brownware was used mainly for the manufacture of ornamental objects, grayware was by tradition essentially confined to heavy, plain, utilitarian vessels, at least at its beginning. Characteristic of early stone pottery is the salt glaze, which is hardly ever smooth or very bright. It usually appears like an "orange peel," or pebbled. It has a stony and irregular appearance (Ramsay 1939:18).

Grayware is made from finer and denser clays than other earthenware. It is fired at a high temperature (2100°F) and the body is almost completely vitrified. The paste is usually a gray color, but can be a light buff color to cream, and may range as far as mustard yellow and reddish brown to deep brown-black (Ramsay 1939:139). Frequently the glazed surface contains small pinhead-size holes where the glaze (primarily lead glazes) has been absorbed by the body.

According to Spargo (1938b:3) this coarse stone pottery was used in the cellar, buttery and dairy, but not in the kitchen. Forms generally include crocks, jars, jugs, churns, and the like. Even when decorated with cobalt blue, they were never found in the parlor or drawing-room. Decoration is usually in cobalt blue, since it will not oxidize at the high temperature required for firing stone vessels. Grayware is frequently marked with the name of the maker, applied with a stamp into the soft clay, or in later times, stenciled in blue (Ramsay 1939:139). A variety of this Grayware is known as sponged-blueware. Distinctive of this variety is the blue decoration on the exterior surface. It appears that a sponge was dipped in blue pigment and daubed on the white enameled surface in no specific pattern.

In another variety, the design has been molded in relief. That portion which stands out in relief has been painted a cobalt blue. The blue pigment is dark or light, depending on the thickness of the enamel. The paste is very light, and with the fired clear glaze covering the areas not in relief, it stands out as a white background. The interior is covered with a clear glaze and appears a "dirty" white.

Stoneware

Stoneware is different from earthenware in that the white body of the former is not porous and does not need a glaze to make it useful for domestic use. Stoneware paste is more granular than porcelain and lacks translucence. This may be less true of late stoneware paste after manufacturing techniques had increasingly improved. The sharp distinction between all historic ceramics in relation to their pastes is not clear-cut or easily recognized. The difference can be seen in the extreme examples, and as the wares approach similarity to one another, positive identification becomes less absolute. For example, it is easy to distinguish between a pure white Ironstone dish and a distinctly blue-gray Pearlware dish, but some companies used less of the cobalt coloring that produced the pearl effect. Therefore, there is a graduation of blue coloring from almost white to pale gray-blue. Only by close comparison of samples with pronounced differences can any separation be made with accuracy.

Stoneware, made from fine, dense clay, and fired at high temperatures, was first made in England and Germany in the 16th and 17th centuries (Ramsay 1939:17). It was not until the 18th century that it was developed into a fine tableware. It was through the efforts of the potters of Staffordshire, England, that the pure white bodies of stoneware were developed.

Ironstone. In 1880 a patent was granted to John and William Turner for the composition of "Stone China." But the actual manufacture and use of the name "Ironstone" began with Charles James Mason in 1813. Mason used a combination of iron slag, flint, Cornwall stone and oxide of cobalt (Ormsbee 1959:78). Mankowitz and Haggar (nd:116) feel that "the patent specifications were false and unworkable." Wedgewood and Ormsbee (1947:144) report that "in addition to dinner services, teapots, and pitchers, Mason made large pieces, such as punch bowls and pitchers of gallon capacity. The latter were octagonal in shape, flared outward to a broad base and had dolphin-shaped handles." Other items that Mason manufactured are fourpost bedsteads, garden seats, fireplaces and great vases (Lewis 1956:Chapter 10).

Ironstone is essentially a utilitarian product, as evidenced by its thick, heavy body. This type of stoneware was used extensively by the American military throughout the nineteenth century, due to its sturdy character. Bemrose (nd:16-17) states that these massive dinner services were made from "China clay, china stone, flint, and bone ash, glazed with obrax, flint and spar."

Ironstone is heavy, dense, and strong and has a white body with a clear glaze. Some pastes are pure white (late), while others may have a slightly yellow tinge (early), or possibly a blue tinge (mainly in Pearl variety). It is generally whiter than cream-colored Queen'sware. (Lewis 1956:Chapter 10).

Ironstone is by far the most abundant type of ceramic found in 19th century sites. The earlier ironstone vessels appear to be slightly thicker and have a yellow tint to the paste. Vessels of a later vintage (ca 1900) are more delicate in that they are thinner and lighter with a pure white paste.

Simpson Springs Ironstone: This type of stoneware represents the largest category of ceramics recovered at the station. Practically all of it came from Structure 4. Several vessels were reconstructed enough to determine their original shape.

Baker's Dish:

Diameter: 19.75 inches; Height: 2 inches; Mark: Laughlin; (Figure 73e)

Plates:

1.	Diameter: 9.75 inches	Height: 1 inch
	Hallmark: Laughlin	Figure 74f
2.	Diameter: 9.375 inches	Height: 1 inch
	Hallmark: Columbia	Figure 74g
3.	Diameter: 8.45 inches	Height: 1 inch
	Hallmark: Anthony Shaw, also impressed circular pattern with "A. Shaw warranted"	Figure 74h
4.	Diameter: 10 inches	Height: 1.25 inches
	Hallmark: impressed "Hotel" of Burford Pottery Co.	Figure 74i

Saucers:

1.	Diameter: 6 inches	Height: .875 inches
	Hallmark: Laughlin	Figure 74c
2.	Diameter: 6 inches	Height: .875 inches
	Hallmark: Smith and Ford	Figure 74d

Cups:

1.	Diameter: 3.5 inches	Height: 3.125 inches
	Appendage: handle	Figure 75a
2.	Diameter: 3.375 inches	Height: 2.875 inches
	Appendage: handle	Figure 75b
3.	Diameter: 3.125 inches	Height: 2.875 inches
	Appendage: handle	Figure 75c
4.	Diameter: 3.5 inches	Height: 3.125 inches
	Appendage: handle	Figure 75d
5.	Diameter: 3.5 inches	Height: 2.5 inches
	Appendage: handle	Figure 75e
6.	Diameter: 3.5 inches	Height: 2.9 inches
	Appendage: none	Figure 75f

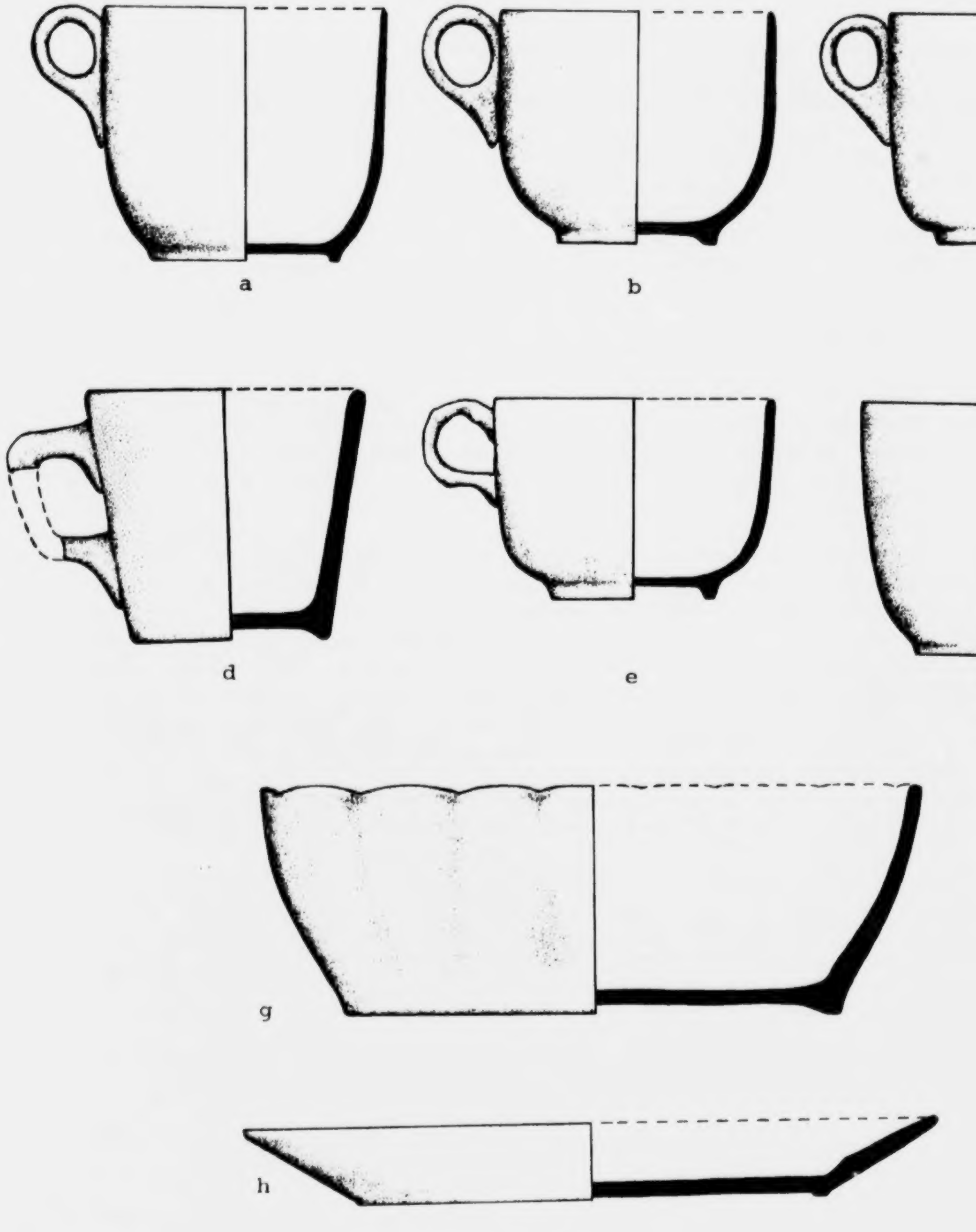


Figure 75.
Stoneware ceramics.

Pearlware. A development from Queens'ware, known as Pearlware, was introduced in 1779. The cream-colored ware was tinted with cobalt that produced a pale bluish-grey surface color (Lewis 1956:Chapter 8).

Josiah Wedgwood was the first manufacturer of this variety of stoneware, and by the nineteenth century, many companies were imitating it. Pearlware is not a cream-colored variety, since more calcined flint and china clay are included in the white paste mixture. When examined by itself, a sherd of this variety will have a very white appearance unless too much cobalt was added. When compared with a pure white sherd, the color shading becomes obvious, depending on the amount of tint. It was always coated with a colorless glaze and was used mainly for table services (Hughes 1956:121).

Simpson Springs Pearlware: This type represents the second largest quantity of ceramics recovered at the station. The reconstructed vessels below are all from Structure 4.

Fluted Nappy:

Diameter: 8.25 inches Height: 2.75 inches
Hallmark: none Figure 75g

Plates:

1. Diameter: 8.625 inches Height: 1 inch
Hallmark: Burford Bros. Figure 75i

Saucers:

1. Diameter: 5.75 inches Height: .875 inch
Hallmark: none Figure 76a

2. Diameter: 6.375 inches Height: 1.25 inch
Hallmark: Royal Seal and Shield Figure 76b

3. Diameter: 5.75 inches Height: 1.25 inch
Hallmark: Royal Seal and large "T" Figure 76c

4. Diameter: 6.25 inches Height: 1.25 inch
Hallmark: Knowles, Taylor Figure 76d
and Knowles

5. Diameter: 6.25 inches Height: 1.125 inche
Hallmark: Dresden Figure 76g

Cups:

1. Diameter: 3.375 inches Height: 3 inches
Hallmark: none Figure 76e

Lid:
1. Diameter: 5.5 inches Height: 1.25 + handle
Figure 76f

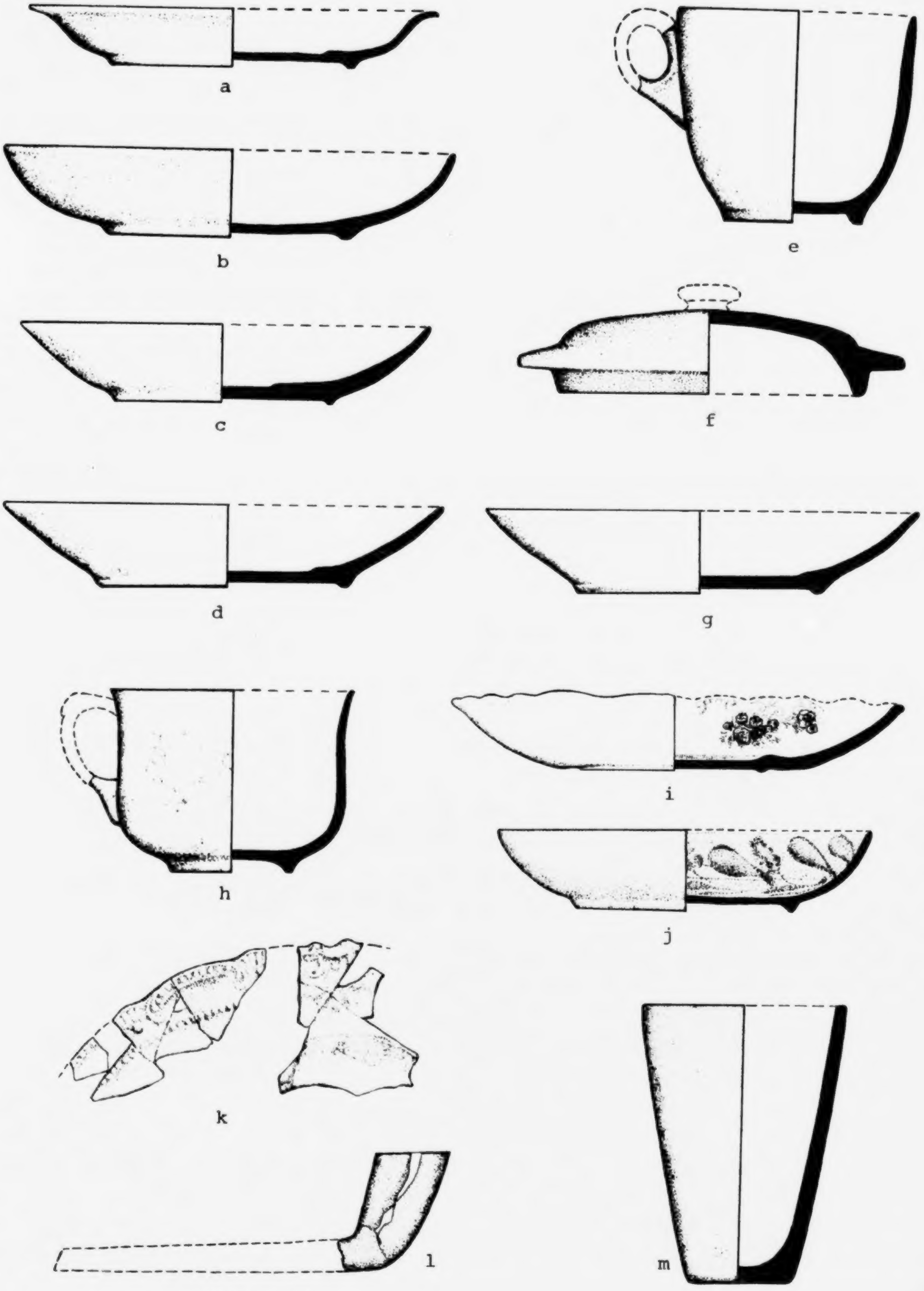

a
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Figure 76.
Stoneware, Porcelain and other ceramics.

Transferware. John Sadler and Guy Green invented the process of transfer printing in 1752. This process is described by Hughes (1956:148):

> *Transfer printing began with engraving the design in such a way as to produce sharp clear lines on a thin copper plate, made hard-textured by the battery hammer. The engraved plate was warmed on a stove and coated with a prepared color. This was rubbed into the incised lines with a wooden tool and any excess removed with a flexible steel knife. The plate was then wiped with a beaver pad, leaving color in the incised lines. A sheet of thin, strong tissue paper was made nonabsorbent by brush-coating with printer's size. When dry, this paper was laid upon the prepared copper plate and subjected to pressure so that it received a clear impression of the design. When the paper was peeled from the copper it bore a perfect imprint. This inked impression was laid over the ware and rubbed gently with a flannel.*

At first, potters like Wedgwood sent their biscuit vessels to Liverpool for transfer printing by Sadler and Green (Ormsbee 1959:5). It was not long, though, before individual factories had the equipment to print their own ceramics. These first vessels were transfer printed with a black design, but this was soon followed by dark blue. G. Bemrose (nd:23) states that

> *Onglaze transfer printing was earliest in use, being practiced in porcelain and earthenware in the second half of the eighteenth century, usually in black, blue, pink or brick red. A pleasant brown and a harsh purple are found on creamwares late in the century. Underglaze colors for printing began to make their appearance towards the end of the eighteenth century. Black, cobalt blue, brown, and perhaps pink were used before 1800, but the enormous quantity of "blueprints" from about 1810 onwards entitles us to regard this ware as a nineteenth century specialty. Other underglaze colors followed; orange from litharge and antimony, purple-brown known as "mulberry" from manganese, cobalt and nitre, were in use before 1830. Later, chrome green and a hideous blue-green favoured by the Ridgway factory, and finally rose-pink were pressed into the service of transfer printed pottery which had a great vogue in Europe and the Americas.*

Using this process, Josiah Spode was so exacting that his clarity of outline and brilliance of color brought his wares immediate popularity (Hughes 1956:148). Spode originated the famous blue and white Staffordshire, but never produced any with American views (Wedgwood and Ormsbee 1947:140).

During the late 1700s, the cross-hatching used in designs was slightly smudgy, but this was improved about 1800. Variations of color tone were made possible in the early 1800s by the use of thin lines, which produced dark and light shades. After 1810, more precision of tone variation was accomplished by combining lines and stipples (Hughes 156:148).

It was not until 1825, at the Jersey City Pottery, that the first transfer printed vessels were produced in the United States (Stiles 1941:62).

Blue Transferware. The last ten years of the eighteenth century marked the beginning of several events that changed people's lives, both the rich and the poor. So many blue transfer printed ceramics were now being produced that for the first time there was the opportunity for common folk to own table services artistically decorated (Wedgwood and Ormsbee 1947:160). The rich were able to obtain all types of service sets with the personal touches of famous artists. With these new markets, firms such as Spode, Adams, Bournes, Minton, Ridgeway and others made their fortunes. Demand for blue transferware was tremendous, especially in the Willow Pattern. The Willow Pattern is a pseudo-Chinese motif introduced by Thomas Turner of Caughley, England, about 1780. Connected with this tremendously popular pattern are numerous poems, songs and legends. Through traditions, Hodgson (1912:43-44) depicts the scenes in the pattern as related in the following Chinese love story:

> *Koong-Shee was the daughter of a wealthy mandarin, and loved Chang, her father's secretary. The mandarin, who wished his daughter to marry a wealthy suitor, forbade the marriage, and shut his daughter up in an apartment on the terrace of the house which is seen in the pattern to the left of the temple. From her prison, Koong-Shee "watched the willow tree blossom," and wrote poems in which she expressed her ardent longings to be free ere the peach bloomed. Chang managed to communicate with her by means of a writing enclosed in a small coconut shell which was attached to a tiny sail, and Koong-Shee replied in these words, scratched on an ivory tablet: "Do not wise husbandmen gather the fruits they fear will be stolen?" and sent them in a boat to her lover.*
>
> *Chang, by means of a disguise, entered the mandarin's garden and succeeded in carrying off Koong-Shee. The three figures on the bridge represent Koong-Shee with a distaff, Chang carrying a box of jewels, and the mandarin following with a ship.*
>
> *The lovers escaped, and "lived happily ever after" in Chang's house on a distant island until, after many years, the outraged wealthy suitor found them out and burnt their home, when, from the ashes of the bamboo grove, their twin spirits rose, Phoenix-like, in the form of two doves.*

There are subtle differences to aid in identifying the manufacturer of specific willow patterns. The original had no individuals standing on the bridge, but the succeeding impression has one man on the bridge, while the third has two men. In each version, there are 29 apples on the tree (Hughes 1955:51). It was the late 1780s when Turner developed the better-known version. The pagoda is on the right side surrounded by willow, peach, fir, plum, and apple trees, and a tree with dark circles.

Thomas Minton maintained the main motif, but varied the fence pattern, the number of apples in the tree, and the rim design. Starting in 1785, Josiah Spode made the willow pattern, resembling the original but with 32 apples. Wedgwood used the pattern from 1795 with 34 apples. Adams of Greengates made the pattern with 32 and later 50 apples. Davenport's tree had 25 apples from 1793 to about 1830. The potteries of Swansea, Wales, produced the pattern occasionally in black and brown and with 30 apples (Hughes 1956:157). A common dish on which this pattern was extensively used in blue was the cup plate. It was the social custom of many areas from about 1800 to 1870 to drink tea from the cup saucer, meanwhile placing the cup in the small cup plate provided for it (Hughes 1956:57). The saucer was made deep for drinking tea from it. Another type, but less common, was the barber's dish. This type of vessel has a wide rim, notched to hold the neck of the person being shaved. Another very popular pattern in the blue style was the "Broseley Blue Dragon Pattern."

Each large pottery that produced transferware ceramics had a distinguishable border style which only that particular company used. These patterns were usually registered, to restrict other companies from copying them. Patterns for these borders are shown in several books, one being Hughes (1956:149). Some of the more obvious ones are Spode (birds and animals), Clews (birds on stepped design), Ridgeway (crackled), Wood (sea shells), Jackson (scenery), Stubbs (eagle), etc.

Color offers a means of dating these vessels. G. Godden (1966:6) states:

> *Most printed English earthenwares of the early 19th century were in the still popular underglaze blue of the typical Willow pattern type. The blue color itself often offers a general guide to date, although the color used by some individual potters tended to be characteristic and confined to their own products. In the 1810-20 period, the blue is of a medium dark shade; in 1820-30 it is of a decidedly lighter color. The American market favored a very dark blue in the 1825-30 period.*

Simpson Springs Blue Transferware: Only four small sherds of this type from Structure 4 were found during the excavation. They are all underglazed transfers (Figure 77a&b).

Red Transferware. The red color was used for transfer printed designs about as long as the blue, but not in the same quantity. The only difference in the red variety is the color. The other varieties are also based on the color of the transfer print.

Simpson Springs Red Transferware: One sherd of this type was found in Structure 4. The transfer pattern, size, and shape of the vessel could not be determined (Figure 77c).

Green Transferware. Sherds of this type are mostly very small fragments decorated with floral motifs (Figure 77d-e).

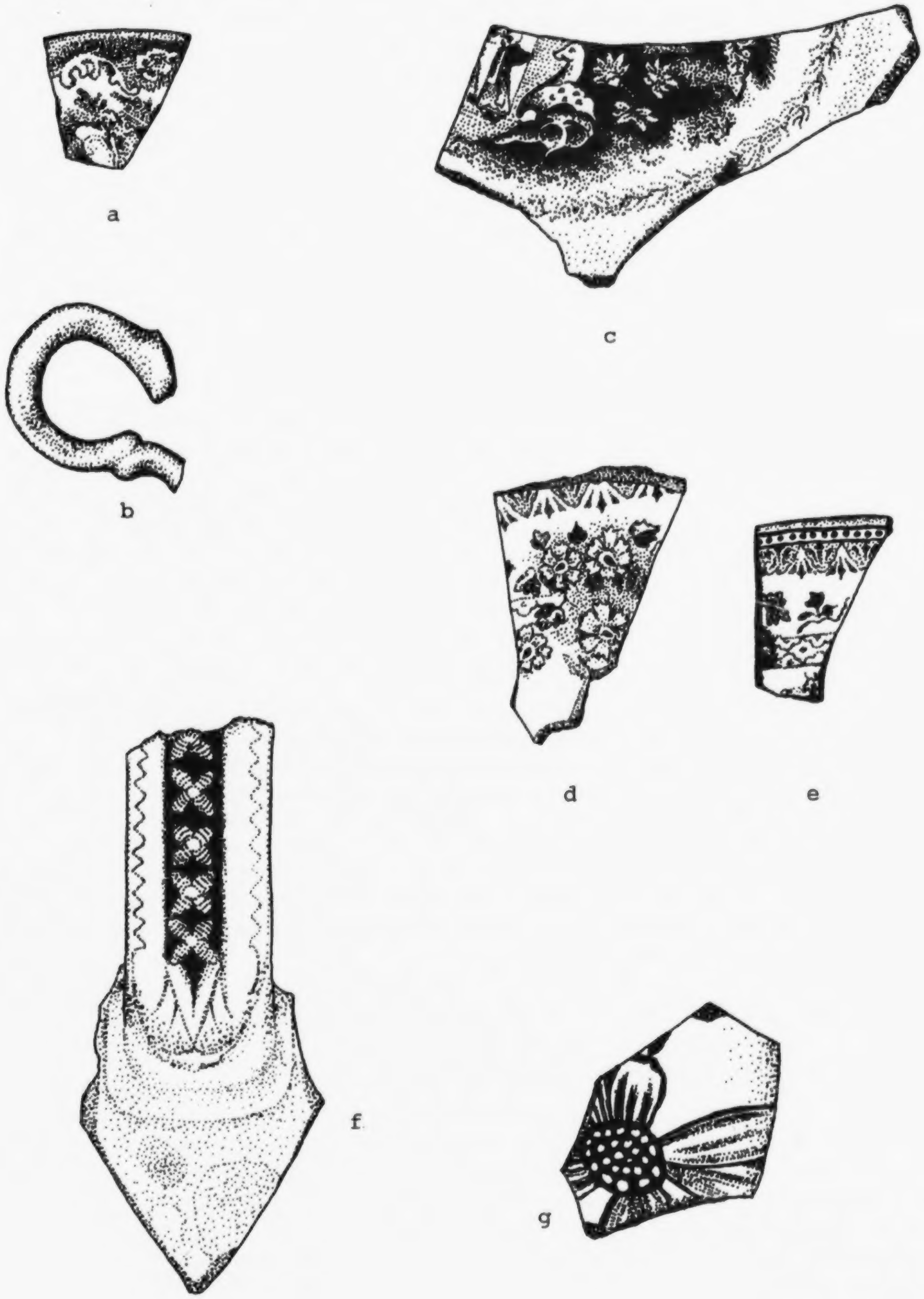


Figure 77.
Transferware sherds.

Brown Transferware. The size and shape of the vessels for which the sherds of this type came from cannot be determined (Figure 77f-g).

Other styles of transferware are as follows:

Black Transferware. This variety was often called "Jet-Enameled Ware" (Mankowitz and Haggar nd:118). It was a celebrated style of Worcester in the eighteenth century.

Polychrome Transferware. Before the invention of transfer prints in polychrome colors in about 1828, it was necessary to paint by hand any designs where a combination of colors was desired. This resulted in a transfer print in black, brown, or other colors, with flowers painted in different colors. Usually the painting on the transfer design resulted in the paint going over the boundary lines of the design. Since this variety had to be finished by hand, it was naturally more expensive.

Multiple Transfers. In 1848 Jesse Austin, head engraver of the F. and R. Pratt & Company, Fenton, Staffordshire, invented a process for polychroming vessels, mainly pot lids. By underglaze transfer printing, five transfers superimposed on one another produced the multi-transfer variety. The first three or four transfers were usually stippled in buff, blue, pink, and red, while the final transfer was a line-and-stipple engraving in brown. Tiny circles were placed on each side of the transfer for lining up each stage of transfer printing. Sometimes finishing touches were done by hand. This can be detected by their being slightly raised. Most vessels were decorated with copies of works by famous painters (Hughes 1956:127-128).

Underglaze Polychrome Transfers. F. Collins and A. Reynolds, Hanley, invented the process of multi-color underglazing ceramics in 1848. At first, three colors were used: blue, red, and yellow; later (1852), brown and green were added to the list (Hughes 1956:149). In this process, multi-colors could be fixed from a single transfer and they required but one firing. It was found that mixing certain enamel colors with Barbados tar (Barbados is an island of the Windward group in the West Indies) would cause colors to adhere to the surface and not distort (Hughes 1956:54). The process was discontinued in the 1860s.

Examined under a binocular microscope, colored glaze sherds of this type have a smooth-flown effect that blends into the clear glaze over it. The use of reflected light on the surface of the vessel reveals no dull spots on vessels decorated over the clear glaze surface. In the Underglaze Polychrome variety, the fill-in colors do not often match the outline intended for that color. Sometimes the underglaze colors will work their way to the surface as the clear surface glaze wears away by constant use. Colors are usually outlined in a dark color.

Overglaze Monochrome type. The first use of transfer designs was in the overglaze method, the transfer being printed on the surface of the clear body glaze. Evidently some firms continued to use this method for a long time, since sherds of this type are found in later sites. Of course, these sherds may be heirloom vessels, broken years later, after their period of intensive household use.

Overglaze Polychrome type. There is a distinct difference between the overglaze method of decoration and the decal method. The treatment is similar to that of underglaze polychrome except there are fewer outlines for the colors and the colors seem paler. The surface of the glaze is smooth and uniform. The color glazes can be felt on the surface with the tip of the finger when rubbed slightly and gently.
Simpson Springs Overglaze Polychrome type: One cup of this type was found in the ruins of the Structure 4.

Diameter: 3.44 in.	*Height: 2.63 in.*
Hallmark: none	*Appendage: handle*

Decoration: Dark blue flowers with small light blue leaves outline in brown (Figure 76h).

Decalware. In order to open the market of the middle class to polychromed tableware, a new method of multiple color decoration was introduced about 1860. With special pigments of ink, a design was transferred from a paper decal, which was then transferred to the already glazed vessel (Ormsbee 1959:5). The decorations of this type appear much sharper in detail than those of transfer-printed ceramics. The color fills in precisely the outline of leaves or flowers, and various shades are used in one flower or leaf. Even on examination of decal designs with a hand lens, the designs appear sharp and distinctive. This is not the case with transfer printed designs.

With this method, a wide variety of colors was used (Durrenberger 1965:10). Decals made possible the realism of color intonation, and shading could be used effectively.

Since the decal is placed on the vessel over the already fired glaze, the design can be felt with a slight touch of the finger. The decal can also be scratched off of the clear glaze surface with a hard knife blade. If a freshly fractured edge is examined with a hand lens carefully, the decal may be seen sitting on top of the clear glaze. A close examination of the decal paints will usually show that the paint is applied evenly and appears uniformly stippled across the whole decoration.

The basic appearance of the applied decal paint is different from that of the transfer paint. The transfer paint lines are seen as not even or uniformly wide when closely inspected with a hand lens. The hand-painted fill-in colors do not stay within the outline of the motif as they do with decals; therefore, the latter are much sharper. Transfer designs are smooth and do not have the stippled look of decals. However, there are exceptions to this in areas where many transfers did use stipple for fill-in, but a close examination of the whole design will show that the stippling is not inherent in the overall design.

Decal colors will appear in slight relief when the light is reflected from the vessel's surface. This reflection will not be uniform as in overglaze decoration, in that the latter's surface glaze is smooth and reflects light uniformly. On the design, texture reflects the cloth weave of the decal. This is due to the closeness of the stipple marks; this in turn is an indication of the fine cloth used in the decal transfer.

This method of decoration is called "decalcomania." With it, the manufacturers could produce polychrome pottery cheaply and thereby exploit the middle-class market. Before this, the less wealthy people could not afford to buy expensive hand-painted wares or those produced by the time-consuming multi-transfer processes. The United States imported from England the printed decals used by the eastern potteries on their wares for many years (Stiles 1941:91).

Simpson Springs Decalware: Several saucers were found in Structure 4. The decal design represents blue and red roses with blue and green leaves. The embossed edges have been gilded.

Saucer:

Diameter: 6.5 inches *Height: 1.125 inch*
Hallmark: J. & G. Meakin *Figure 76K*

Several type of ceramics have gilding as an additional decorative element. Gold lines are applied to the surface of the clear glaze by mixing gold in a liquid that will keep the metal in suspension. The vessel is then heated to a temperature hot enough to vaporize the liquid and to leave the gold attached to the surface glaze.

Gilding is usually placed on decorative objects rather than "useful" vessels because the gold wears off the glaze surface easily. It takes very little time for the vessel to lose its decoration when continually in use.

Peasantware. By the turn of the nineteenth century, commercial enterprise was highly competitive, and potters either produced in abundance the popular wares or tried to create new and better styles in the hope of cornering a new source of sales. Also at this time, business-minded men such as Josiah Wedgwood became aware of the potential of the middle-class market. The potential was tremendous if only dinner services could be produced at a price standard low enough to entice the working class family to buy them. Transfer-printed vessels were beyond the financial reach of these middle-class people.

There appeared on the market from 1810 onward, a style of boldly painted whiteware that would appeal to the ever-increasing working-class citizens (Bemrose nd:9). These vessels were painted in bright enamel colors or simple designs that catered to the working folk. This was "peasantware" pottery, as those styles were called that were produced cheaply and appealed to the lower income family. This simpler ceramic type is known to have been produced by Adams of Greenfields, Tunstall; Rogers of Burslem; Davenport of Longport; and the Copeland factory (Bemrose nd:9).

The decorations indicate that motifs from the earlier slip wares and salt glazed pottery were reincorporated for use on peasant pottery. It was in this ware that a peculiarly indigenous English style of folk art was retained. G. Bemrose (nd:9) states: "The decoration was by artists accustomed to work in resist lustre wares, an indication not only of the readiness of decorators to turn from one class of ware to another, but also of the many different types produced by a single factory in a relatively short space of time." Bemrose (nd:31-32) goes on to say that "a good deal of our unlettered art, especially the so-called 'peasant style,' appears to lie dormant in our racial consciousness, ready to spring into fresh life when conditions are favorable. Some nineteenth century embroidery and the virile painting seen on canal barges are cases in point." He goes on to state:

> *The cheaper domestic porcelain made in Staffordshire and elsewhere between 1800-1830 has much of this feeling. Simplicity was achieved not by intention, but by commercial necessity. Very little apart from ordinary tea and kitchen ware was produced, though some of the factories catered for special markets. Shapes were of a more simple kind than those of the costly wares and a strong illustration of working class conservatism is to be seen in the survival of tea cups without handles. Teapots and cream jugs were copied, almost exactly from contemporary silver or plate. Occasionally, little masterpieces of true peasant design were produced at the New Hall factory of Hollins Warburton & Co. and at Mintons where an anonymous decorator worded in a curiously attractive oriental style. The term "New Hall" has come to be accepted as a label for all this unsophisticated china, but it is certain that much of it was made elsewhere. Minton, Davenport, Mason, Chamberlain, and Caughley among others are known to have produced similar wares. At Wirksworth in Derbyshire closely similar porcelain was produced after 1800 for a few years. Wasters from the site indicate that New Hall was imitated both in shape and decoration.*

Peasant pottery had its beginnings with the painting of simple motifs, usually flowers, and folk scenes.

The decoration is hand painted in bold brush strokes. Leaves seem to be painted with one stroke of the brush, and flowers required only a few more. For the leaves, the brush is controlled by pressure to narrow or widen the design. The colors of plants may or may not be realistically employed. Leaves are often painted in blue. None of the designs are outlined or stippled as in transfer-printed and decal-printed vessels. Brush strokes are obvious and the paint is shaded by the uneven application of paint by the brush. On the designs, where the enamel colors are darker and therefore thicker, the decoration may stand out in relief. The clear surface glaze is thinner than on other stoneware and does not have enough body to cover over the enamel decoration to form a smooth surface. These floral motifs are at once obviously different from the exacting duplicates made by other than hand-painted process.

Flown blue peasantware. Flown blue is an effect obtained by firing the blue glaze in a volatile chloride atmosphere. The blue design melts into the surrounding glaze, giving a somewhat blurred effect. This style of decoration was quite popular in mid-Victorian times (Victorian era: 1837-1901). Brown, green, and yellow colors, though also used, had little demand by the public (Mankowitz and Haggar nd:90). These other colors date from about 1840 (Ormsbee 1959:5).

Simpson Springs flown blue peasantware: Sixteen sherds of flown blue peasantware came from Structure 4. One sherd represents one-half of a saucer decorated with large blue flowers.

Diameter: 5.25 inches *Height: 1.125 inches*
Hallmark: none *Figure 76j*

Other types of whitewares which may be found in historic sites in the west are:

Cream colored ware. Ceramics with a body of cream color clay have been produced since the beginning of the eighteenth century. The first types had to be covered with a white slip and glaze, but imported clay and calcined flint made cream colored ceramics a reality in 1720 (Towner nd:1). These first cream colored vessels were called "white stoneware" when fired at a high temperature and glazed with salt. When fired at a low temperature, however, and glazed with lead, they were called "cream colored." Small motifs, similar to those found on "redware," were often stamped on the white surface. An interesting event that cause the invention of a new glaze is discussed by Towner (nd:1):

> *The method employed at this time of producing the cream coloured ware was found to be unsatisfactory as the lead powder produced poisoning among the potters, and the grinding of the flint stones a disease known as potter's rot. Patents were therefore taken out between 1726 and 1732 for grinding the flint stones in water, and about 1740 a fluid glaze was invented, probably by Enoch Booth of Tunstall, Staffordshire, in which the lead and flint were both mixed and ground in water. The method was adopted of first firing the ware to a biscuit, and then glazing and re-firing it. The date usually given for this invention is 1750, but in actual fact it must have taken place about ten years earlier.*

The best known potters making this type of ceramics were Thomas Whieldon and John Warburton of Staffordshire. Other large centers that produced cream-colored vessels were Derby, Liverpool and Leeds. Salt glazed stoneware was gradually replaced as the cream colored type grew in popularity (Towner nd:2).

2. Queen's ware. Josiah Wedgwood, a well-known English potter, had always insisted on high standards of production and was

continually developing new types of ceramics (Ormsbee 1959:140). Wedgwood discovered that by using "china clay and china stone," plus a new glaze called "Greatbach's china glaze," he was able to produce a much paler white, or ivory color. How the naming of this variety came about is quoted from Wedgwood and Ormsbee (1947:48-49):

> *In 1762, when commissioned to make a breakfast service for Queen Charlotte, Wedgwood gave it his personal attention and even supervised the "burning in the gold" as well as the painting of the bands of flowers by the well-known artist, David Steele and Thomas Daniel. This won him a royal warrant. He was now "Potter to Her Majesty the Queen," and in appreciation for such royal favors he named his improved cream colored table pottery "queen's ware." He later added another royal warrant when he made a dinner service for George III, marking on the back of each piece "The Royal Pattern" in gold.*

This cream colored Queen's ware was Wedgwood's mainstay during his early years at Burslem. Those vessels made for dinner, breakfast, dessert and tea services were nearly always decorated (Wedgwood and Ormsbee 1949:134). In 1752, John Sadler and Guy Green, printers of Liverpool, discovered a method whereby a design could be transferred from a copper engraving onto pottery (Lewis 1956:Chapter 8). Wedgwood arranged to take wagon loads of biscuit Queen's ware to be decorated by Sadler and Green.

Between 1785 and 1790, Wedgwood manufactured a form of Queen's variety which was pierced to form a decorative pattern (Wedgwood and Ormsbee 1947:136). Of this reticulated pottery, the oval and footed fruit bowl is typical. The lower part of these bowls was molded to look like basketwork.

For Wedgwood's finest pieces of Queen's variety the designs were handpainted by competent artists. His largest and most elaborate service, which consisted of 952 pieces, was made for the Empress Catherine II of Russia in 1744 (Lewis 1956:Chapter 8).

A common pattern used on Queen's variety was the "Liverpool Bird" pattern, consisting of English peasants against a natural background (Wedgwood and Ormsbee 1947:134).

In the New World, at Bennington, Vermont, Judge Lyman Norton and his son, Julius, imitated Queen's variety in the form of Yellowware Earthenware beginning in 1831 (Cox 1944:991).

After the Revolutionary War, Staffordshire pottery started to decimate the American market. Most of these vessels were decorated with American views. Cox (1944:991) describes this event as follows:

> *Wedgwood is thought to have sent his best wares to the colonies and was worried about the possible competition there, but he need not have worried for soon after 1783 the flood of "English cream ware" from his factory and others*

> *swamped the market. The case of Bonnin and Morris in Philadelphia was typical for no sooner had they made American "bone-china" than large cargoes were dumped, and brought about their bankruptcy.*
>
> *When the war spirit swept the country there was no liking for the English wares and small potters again sprang up and the larger places were able to pay expenses, but the result of this boom was a cheapening of the qualities because of the financial conditions and because some of the good English potters living here withdrew and went home. In 1783 when the war of arms ceased, England again commenced the economic war. Huge amounts of transfer printed wares were sent over with portraits of Washington, Franklin, Jefferson and other national figures. This was not, of course, very patriotic of the English merchants but they have always been broad-minded and have had the "progress of mankind" in mind. They even went further and wrote mottoes on pieces expressing British humiliation and American exultation over victory.*
>
> *So clever were they that soon the Americans actually became ashamed of home products and thought the "imported" things were the only ones worthwhile. Even the excellent wares made at Bennington were demanded by dealers unmarked so that they could be sold as English. By the end of the 18th century there was hardly a factory worth mention left in America.*

Cauliflower ware. B. Hughes (1956:37-38) describes this cream colored variety as follows:

> *Cream coloured earthenware (herein called Whiteware) modeled and coloured with green and yellow glazes in imitation of a cauliflower developed by Josiah Wedgwood during his partnership with Whieldon 1754-59. Such pieces are recognized by a clear orange-brown tint with applied foliage in pale yellow. The term is also understood to include similar wares based on melons, pineapples and maize. These were imitated by many other potters of the period, especially in Staffordshire. Reproductions were made in the mid-19th century, but modeling, colour and glaze were so inferior as to make them easily recognized.*

Gaudy Dutch ware. A style similar to that of the Peasant variety may appear in southwestern sites. Though it is essentially characteristic of Pennsylvania, one should be acquainted with this ware.

Wedgwood and Ormsbee (1947:160-162) describe this variety in detail. They are quoted here at length:

> *The colorful china that the Pennsylvania German farmers bought a century and a half ago as their "best dishes" is a concrete example of the adaptability of Staffordshire potters. Had they had a slogan in the days when they were cornering various china markets, it would most certainly have been the Biblical one of "all things to all men." Indeed, had these potters been less thorough in their hunt for new markets they*

> *might have overlooked a prosperous and closely knit racial group living in the fertile area west of Philadelphia. Their ancestors, a persecuted minority, had emigrated from the Counteis Palatine of the Rhine Valley over a century before. Among the traits handed down to their descendants was a love of color, robust and flamboyant. The Staffordshire potters gave it to them in the highly decorated dishes now known as "Gaudy Dutch." It was gaudy all right, and made for the Pennsylvania Dutch market, but the Netherlands had no part in it and the English potters did not originate the design. They merely took the Imari designs of the Orient, which had already been used on eighteenth century English porcelains, such as Worcester and Derby.*
>
> *For the gold of these costly pieces they substituted a strong yellow in decorating the earthenware dishes made for shipment to the five counties in Pennsylvania where it was in favor from 1800 to 1850. Other colors used in the freehand decoration of this ware included cobalt blue, apple green, rust red and clear pink. About twelve distinct variations of the original Oriental motif were used, but the potters seem to have had no particular names for them. Also, they probably never heard the term, "Gaudy Dutch."*
>
> *Pieces found today in various patterns include most of the tableware in vogue at the time, such as platters, plates, handleless cups and deep saucers with cup plates, bowls, sugar bowls and cream pitchers, teapots, coffee pots and the like.*
>
> *The variations of pattern are somewhat confusing to identify, since the names given them are by no means accurate from a descriptive point of view. They are butterfly, carnation, dahlia, double rose, dove, grape, primrose, single rose, sunflower, urn, Indian war bonnet. The last is one of the best designs. In this, for the central decoration, is an arrangement of blue feathers, one above and four beneath the headband. True, the feather above looks more like a leaf in shape, and a large multipetaled flower fills in the space in the headband behind the large blue plume. Smaller flowers and leafage take up any spare space around the bonnet, and the edge of the plate is decorated by blue bands.*

The maker best known for his Gaudy Dutch was J. & R. Riley, Burslem (1802-1826). These brothers occupied Hill Works; and on the death of both in 1826, the pottery passed on to S. Alcock & Company (Ormsbee 1959:105).

It would seem that Gaudy Dutch ware designs are not as large as those of the Peasant ware. Gaudy Dutch is also very elaborate in using much of the available space and making extensive use of curved flower stems.

Banded ware. Another type of decoration on stoneware that was also cheap to produce was that on band-decorated vessels. Lines in black or blue were applied to the white body, using one finger as a guide for the freehand style. To produce these bands the potter placed the circular vessel on a wheel which was spun. The brush was loaded with pigment; the hand was steadied by an adjustable rest. Then the thick glaze was applied to the surface of the turning vessel (Hughes 1956:15).

The bands applied to the white surface, especially thin bands, stand out in relief. The wide bands may or may not be in relief. Often it seems that the vessel has a blue body with white lines, but on close examination the raised blue band can be seen on the white body. Occasionally the wide blue lines bear wavy lines in paler blue across them.

The common form of Banded ware seems to be the outflaring rim bowl with banding on the exterior surface. Designs may be alternating narrow blue bands and narrow white spaces. One band may be a wide blue band in the center of the body. This ware may also have narrow black or black-brown bands above and below a wide blue band.

Mocha ware. Another kind of cheap ware whose use spans the entire nineteenth century and which resembles mocha stone (ornamental quartz), from which it received its name, is Mocha banded pottery.

G. Bemrose (nd:10) describes the method of mocha decoration as follows:

> *. . . upon the leather-hard clay, a ground colour was laid, usually grey, blue, or yellow upon which pigment was introduced and allowed to run. This pigment was usually brown in colour and was mixed with a brew of tobacco and hop which controlled the pattern. The result was a fascinating dendritic effect variously likened to trees, feathers or moss. A chestnut brown ground is found on the early creamware specimens; various shades of brown, straw, orange or green are not infrequent on early pieces but white is rare. The moss-like decoration was commonly brown, but green, blue, and black specimens are known; pink is found only on modern pieces circa 1880 and later. The market for which the ware was intended is shown by the shapes. Ale mugs, jugs, ale-tasters, chamber-pots, shrimp and nut measures and pitchers are common. Articles for the dinner table--sugar bowls, honey pots, butter pots, salts, pepper and mustard pots, teapots, coffee pots and basins are less frequent. Although essentially a utilitarian ware Mocha was sometimes used as a decoration for ornamental pieces such as flower vases and pot-pourri bowls with real ceramic distinction. These pieces invariably show refinement of potting. The known makers are Adams of Tunstall, Cork and Edge of Burslem, Broadhurst of Fenton , Tams of Longton, MacIntyre of Cobridge, Pinder and Bourne of Burslem, Green of Church Gresley, Maling of Newcastle-on-Tyne and factories in the Stockton area, Clydeside and perhaps at Swansea and Sunderland. Even Creil in France, a factory staffed at this time by Staffordshire workmen, used Mocha effects on a porcelain body. One unidentified factory,*

> *perhaps Glasgow, produced some admirable pitchers with Mocha decoration in the form of thistle sprays on a caneware body.*

The earliest Mocha vessels were produced on a cream-colored body, but later this was changed to a cheap white ware (Lewis 1956: Chapter 14). Many mocha vessels were made for public houses and required an official stamp which showed that the measurement was true. These stamps may be impressed on lead tags on the handles or engraved into the vessel body. Reign initials on the tags give approximate guide dates for dating the vessels: V.R. = 1837-1901; E.R. = 1901-1910; and G.R. = 1910+ (Godden 1966:75-76). The mocha pottery used in public establishments will probably not be found in the United States, since the seals were an English requirement.

Cork Stamped ware. The surface decoration of this ware is not hand-painted, and yet, judging by detail and sharpness of lines, it is not transfer-printed. It appears to be stamped on the vessel prior to glazing, since the design is under the glaze. Some lines are slightly smeared, as would be expected if hand stamped.

The typical design element is an abstract flower motif that has the appearance of sloppy execution and cheap effect of the decoration. Motifs are usually floral, with abstract flowers as the central feature. The designs usually run around the body, and the rim is commonly banded.

Parian ware. In 1842, W. T. Copeland developed fine stoneware used for statuary figures (Huges 1956:119). It was named after Parian marble, because both are slightly off-white and delicate looking. Before 1852, all statue models were carved by professional sculptors, but after this date copies were made from the originals. Parian ware is not glazed and the surface is, therefore, a dull white, which gives the appearance of sculptured work.

The surface of Parian resembles Jasper ware, so much so that T. J. and J. Mayer, Dale Hall, Burslem, decorated this ceramic with molded figures, then filled in the flat background in dark blue.

Jasper ware. Basically the Jasper ware of stoneware has a compact, hard, white, unglazed body. The paste is tinted by the use of metallic oxides, the most common being light blue, dark green and blue. To the body were added molded relief works, mostly of classical figures, flowers, etc., in white, untinted jasper clay (Godden 1963:31).

Jasper ware was the culmination of experimenting by Josiah Wedgwood. In 1774 he had perfected the Jasper body for ornamental objects. Before 1800, Wedgwood polished the sharp edges of a figure caused by casting with a lapidary stone (Savage 1949:193-194). The cast is ill-defined when removed from the mold, so details were made clear by hand carving. This quality was not found after the turn of the nineteenth century.

Several articles were made from jasper ware ceramics: cameos and intaglios for seals, portrait-reliefs, plaques for inlaying in furniture, beads and buttons, mounts for snuff-boxes and opera-glasses, as well as tableware (Honey 1949:14-15).

Many companies tried to copy Wedgwood, such as Humphrey Palmer, John Turner, James Neale, Robert Wilson, David Wilson & Sons, William Adams, Daniel Steel and J. Adams & Co. (Mankowitz and Haggar nd:18). This type is still being made today.

In 1777 the practice of washing only the outer surface of the white jasper vessel with a colored dye produced a dipped variety. The body remained white while the surface was tinted, usually with dark blue. This variety became the style after 1780.

Between 1780 and 1795, Wedgwood produced jasper ceramics that felt almost like satin, possibly due to polishing on the lapidary wheel and to paste content. This variety is somewhat glossy. It was made only in small quantity for a short period of time (Hughes 1956:91).

Basalt ware. Wedgwood's first ornamental ware was a uniform and dense-grained black stoneware called Basalt. It began to be produced in 1766 and was a refinement of the earlier Egyptian Black, an earthenware stained with manganese dioxide. Basalt type was a mixture of ball clay, calcined ochre, and manganese dioxide. This produced a rich biscuit hue that required no glaze (Hughes 1956:15).

Before the mid-1790s basalt had a glassy appearance, since the ware was burnt with varnish and rubbed. At a later date the black vessels were finished on a lathe, giving a dull, soft, unfired look--a dead black. Many of the best quality objects had relief casts mounted as in Jasper Stoneware (Hughes 1956:15).

Agate ware. The clays of this type are of various colors laid upon one another from which slices are cut transversely by a wire and then pressed into molds. The irregular blending of the clays produced a wavy pattern like that in marble (Hodgson 1912:21). This mingling of various colored clays produces agate ware ceramics.

Before the 1750s agate was glazed with galena, but after this date it was dipped into a transparent liquid lead glaze (Hughes 1956:11). After 1760 the agate vessels were slightly tinged with blue to resemble more the natural stone. Agate vessels ceased to be made about 1780 with the rising competition from cream-colored pottery.

Marble ware. This type is much like the Agate ware, except that the wavy stone effect is accomplished by surface coloring. The marbling is not throughout the paste but only on the surface.

Porcelain

The main feature that separates porcelain from Earthenware and Stoneware is the translucent nature of porcelain. Stoneware is the only ware that approaches porcelain in quality of translucence. Porcelain is always vitrified due to the extreme high temperature at which it is fired.

Most authorities agree there are two general types of porcelain: (1) hard-paste and (2) soft-paste.

Hard-Paste Porcelain

Porcelain made with the ingredients of white china clay (kaolin) and fusible felspathic stone (Cornish stone), which when fired produces a vitreous and extremely hard ceramic material, is hard-paste porcelain (Hughes 1956:124). When tapped with the finger, the thin pieces will have a metallic ring. On a fresh break, the paste is fine-grained, compact, non-absorbent, has a conchoidal fracture, and is close to steel in hardness (Ramsey 1939:155).

The hard-paste porcelain is the true "China," a term denoting its place of origin and too often misused when applied to all types of tableware. All Chinese porcelain is of this hard-paste type and, although the technology of making china was known to English and Americans earlier, they produced little of it before 1900. Several authorities state that a knife will leave a black mark on hard porcelain, but will scratch soft-paste porcelain. This is not necessarily so. The body of the hard-paste porcelain is fired at a temperature withstanding a degree of heat that would crumble some soft-paste vessels subjected to such heat. A common distinction of hard-paste, though not always so, is that decoration has to be placed overglaze, since it would burn off at the extreme temperature in which the body is fired. However, all enamel decoration is placed on the clear surface glaze.

On a fresh break, the paste will appear uniform from surface to surface. This surface is also non-absorbent because of the fusing that takes place in the firing. This surface is often very glassy, indicating this fusing. It is often hard to distinguish where the glaze ends and the inner paste begins on clear glazed vessels. This is readily seen on colored glazes, but the actual textural difference cannot be observed. The most striking feature, and possibly best for identification, is the bluish tint of the paste.

The importation of Chinese porcelain by England reached its climax between 1760 and 1780. After this, it gradually declined because of increasing competition from English factories. Moreover, the Chinese had shipped such large quantities that they succeeded in flooding the English market. By the early 1800s, trade had almost ceased due to the porcelain production of Worcester, Derby, Coalport and Staffordshire factories and the new cream-colored wares. In the United States, trade with China continued and the use of American motifs increased about 1800 (Du Boulay 1963:110).

A common form of rice bowl found in various sites in the West is what Bushnell (1899) has called the "Peking Bowl." It has a small ring-base and is glazed in a pale green color (celadon, which may or may not be decorated).

Another common type is one with scenes of the Orient hand-painted in polychrome colors and gilded to accentuate costumes. The many colors overlay each other and make the surface feel rough.

The vessel is painted after it has been clear glazed and fired, and therefore the decoration stands out in relief.

Simpson Springs Porcelain: Most of the Porcelain from Structure 4 probably represents one saucer which had been decorated with a pink body and white rim. The bottom of the interior was decorated with purple and red flowers with green leaves (Figure 76k).

Soft-Paste Porcelain

During the eighteenth century, in an attempt to duplicate the Chinese hard porcelain, imitations were made of a frit composed of white sand, gypsum, soda, alum, salt and mitre melted into a mass and pulverized to add to the clay (Hughes 1956:125). Nearly all of the porcelain produced, other than oriental, was of the frit type. The body was creamy or ivory white and acquired a waxy surface upon glazing. Soft-paste porcelain types included Frit porcelain, Bone porcelain and Glass porcelain. Frit porcelain was probably the type that could be scratched with a knife blade.

It is hard to clearly distinguish what is actually hard paste and what is soft paste at the point where the two approach each other in composition and/or physical attributes. Soft paste porcelain is absorbent and does not appear as fine-grained or dense as hard paste, but this distinction is hard to make as the two become more alike. The soft paste needs to be glazed for domestic use due to the absorbency of the body. This is done after the biscuit is fired; therefore, the surface glaze appears distinct from the body due to the fact that the glaze is fired at a lower temperature than the body. The surface glaze may have a number of small holes the size of a pin-head caused by absorption of the glaze into the body during firing. Through close study of the paste and glaze, the distinction between the three types can be identified.

In 1800, Josiah Spode introduced a new porcelain composed of kaolin, calcined bone, and feldspar (Ramsay 1939:155; Spargo 1938b:16). This type he called "Bone China," still a favorite among English manufacturers today. Bone porcelain differs from China porcelain in that the paste is a creamy color or may have a yellow or gray tinge. Bone porcelain is also more granular in texture. It may be very vitreous at the surface, becoming more granular near the middle of the wall. With a hand lens one may also see in the paste a number of air holes or even specks of burnt foreign matter. The softness of the paste is relative to the amount of bone ash added to the clay.

Glass porcelain is extremely white and, typical of glass, has a pronounced conchoidal fracture that is very sharp on the edges. Sometimes so much glass is added that there becomes the problem of whether to classify the object as glass or pottery. Translucence depends on the amount of silica in a vessel. The more glass present, the more a vessel will pass light through its walls.

Glass porcelain is very vitreous when much glass is present and appears more like bone porcelain when less glass frit is used.

The first soft paste porcelain was composed largely of silica glass. The transition from glass to bone took place between 1750 and 1800, culminating in Josiah Spode's manufacture of bone china.

The same methods of decoration used on the other porcelain types and whiteware were also applied to glass porcelain. Decoration in the form of decals, transfers, hand-painting, embossing and molding were used. Glass porcelain was used extensively for the manufacture of dolls or other toys, like miniature table services.

None of this type was found at Simpson Springs.

Hallmarks

Besides the general means of dating historical pottery such as style, decoration, technology, and so forth, hallmarks provide the most practical way of establishing dates of manufacture. Not only does the mark provide the manufacturer's name, and therefore a relative time span, but the mark itself gives clues to the absolute dating. Hallmarks are applied to the vessel, usually the bottom, in four basic ways: (1) impressed, (2) printed, (3) hand-painted, and (4) stamped. The printed marks are the most common, with the mark commonly being the same color as the vessel decoration. This is especially so with transfer printing (Godden 1966:1).

As to the hallmark itself, the maker's full name or initials are generally included in or by the mark. The mark may consist of a royal seal or arms, trade mark, some type of crest, a pattern name, a type of body, or simply initials. The royal seal may be found on either English-derived or American ceramics.

The pre-Victorian marks, before 1837, show a small shield in the center of the royal arms; and the lion and unicorn, on opposite sides of the mark, face the observer. The Victorian, post-1837, arms have simple quartered arms, while the lion and unicorn are smaller and face the arms. Many printed English hallmarks incorporate an oval garter or belt-like device which dates after the 1840s (Godden 1966:2).

The addition of the word ENGLAND to the hallmark dates the mark after 1891, to comply with the McKinley Tariff Act, which required the country of origin to be stamped on all imported pottery and other imports to the United States (Ormsbee 1959:16). A few firms, such as Grainger and Wilkinson, did use ENGLAND before 1891.

In dating English vessels, Godden (1966:3), in addition to the above factors, lists several other useful methods: use of the royal arms in 19th century or later; incorporation of pattern name subsequent to 1810; the use of "Limited" to denote a date after 1860 and more likely after 1810; the use of the word ROYAL in the manufacturer's title or trade name to suggest a mid-nineteenth century time period; the words TRADE MARK after the Trade Mark Act of 1862; and MADE IN

ENGLAND to signify a 20th century date. For examples of the means of dating registration marks, see Godden (1963:167) or Bemrose (nd:44).

Hallmarks from Simpson Springs Ceramics: Marks from the following pottery manufacturers were recovered from the excavations at Simpson Springs. The data are summarized from Thorn (1947), Ramsay (1939), Cox (1944), Blacker (1926), Hughes (1956), Mankowitz and Hagger (nd), and Ormsbee (1959).

Homer Laughlin. East Liverpool, Ohio, 1874-1900+. Laughlin Bros., 1874-1879, White Granite, underglaze stoneware, Homer Laughlin, 1879-1897, porcelain added 1885-1889; Laughlin China Co., 1897-?, semi-porcelain. Marks on White Granite show an American Eagle over the British lion. On semi-vitreous china toilet and table services the same symbol is used within a circle, with the name of the company enclosed in the ring. Underneath is printed the pattern name, such as, "Colonial," "Golden Gate," "An American Beauty," etc. On one line a horseshoe and crossed swords was used. Hotel ware was marked with the name "Hotel," within a monogram or a circle stamp (Barber 1904: 110-111). Compare Thorn (1947:133, no. 28) (Figure 78a).

Columbia. No data (Figure 78b).

Anthony Shaw. Burslem, England, from 1850. Compare Thorn (1947:49, no. 30) (Figure 78c).

Burford Bros. East Liverpool, Ohio, 1879-1900. Burford Bros. manufactured floor and wall tile to 1881 and then made cream colored ware and semi-porcelain. On their general ware they used a shield, while on hotel ware the word "Hotel" appeared. On porcelain and china they used the company name, and on dinner and toilet wares there are various flags, shields and the company name in block letters (Barber 19:116). Compare Thorn (1947:120, no. 53) (Figure 78d).

Smith and Ford. Burslem, England, late 19th century. Compare Thorn (1947:48, no. 8) (Figure 78e).

Fine Bone China. The company initials are in the middle of the shield. No data (Figure 78f).

T. The single company initial "T" is in the center of the royal seal. No data (Figure 78g).

Knowles, Taylor & Knowles. East Liverpool, Ohio, 1820-1980, then "Co." added. The company made all types of wares: 1853-ca. 1856, Yellow ware; 1856-1870, Yellow ware and Rockingham ware; 1870-1890, white granite and some "Belleck"; 1890-?, semi-porcelain or Hotel china. The company was established in 1854. It started making ironstone in 1873. Since 1872, it used the bison mark on white granite and stone china and the eagle mark on ironstone. An eagle trademark was used on ironstone in 1879. A number of other marks were used on a great variety of ceramic types, including semi-porcelain, white porcelain, table and toilet services and "Warranted Granite" (Barber 1904:108-109). Compare Thorn (1947:132, no. 29) (Figure 78h).

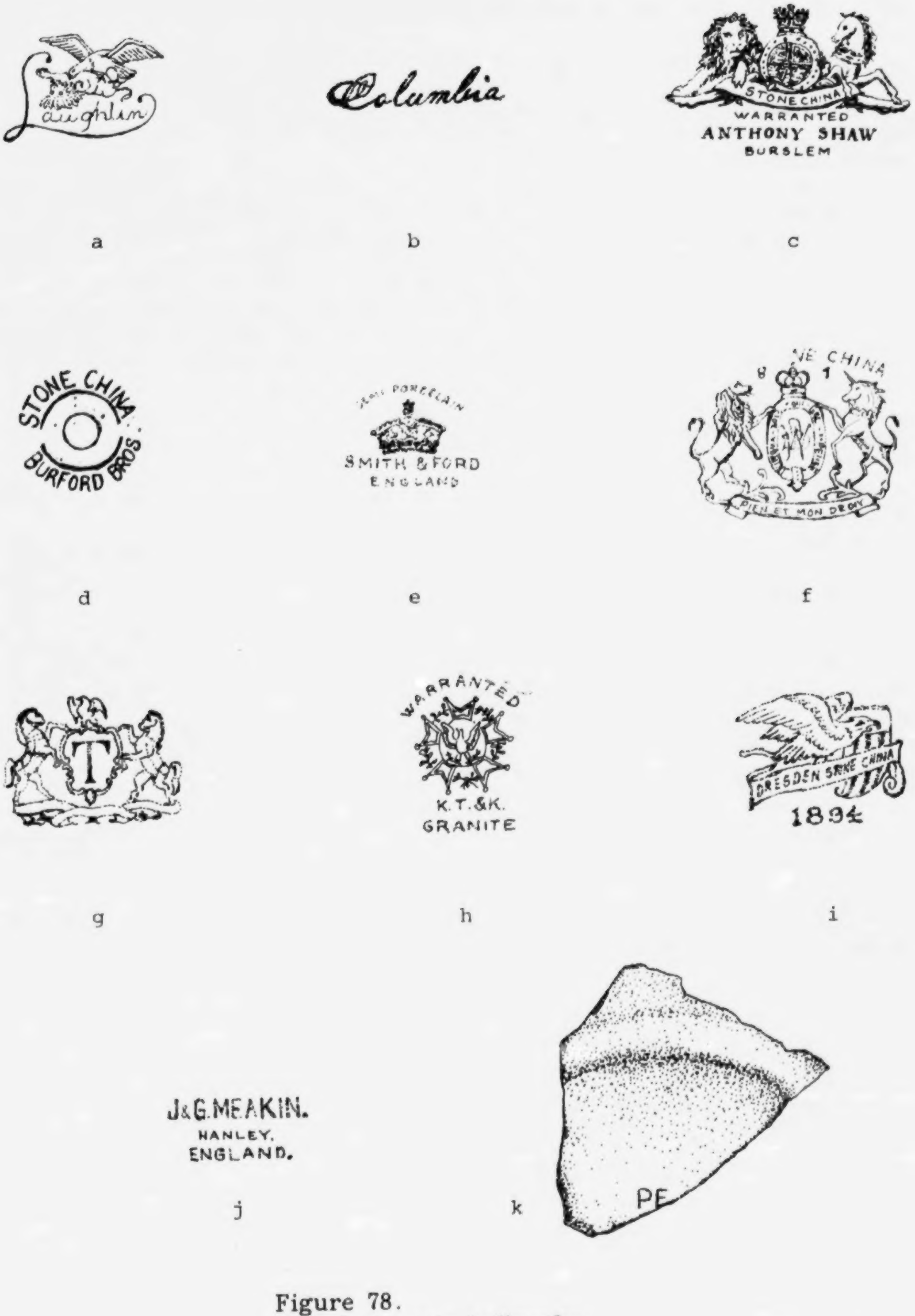

Laughlin
Columbia
STONE CHINA
WARRANTED
ANTHONY SHAW
BURSLEM
a
b
c
STONE CHINA
BURFORD BROS.
SEMI PORCELAIN
SMITH & FORD
ENGLAND
NE CHINA
8
1
DIEU ET MON DROIT
d
e
f
T
WARRANTED
K.T.&K.
GRANITE
DRESDEN STONE CHINA
1894
g
h
i
J&G.MEAKIN.
HANLEY.
ENGLAND.
PE
j
k

Figure 78.
Manufacturer's hallmarks.

Dresden Stone China. The Dresden works was part of the Patters' Co-operative Co. of East Liverpool, Ohio, established in 1876 by Brunt, Bloor and Martin. It became part of the Cooperative in 1892. They made white granite, table and toilet wares, vitreous and hotel china (Barber 1904:111). Compare Thorn (1947:143, no. 37). The mark from Simpson Springs has the date 1894 below it (Figure 78i).

J. & G. Meakin. Hanley, England, 1845 to present. They produced ironstone for the American market (Figure 78j).

PE. No data (Figure 78k).

Chinese Ceramic Marks

Honey (1927:100) classifies Chinese marks into six categories: (1) marks of date, (2) hallmarks and potters' marks, (3) marks of dedication and good wishes, (4) marks of commendation, (5) symbols and emblems, and (6) merchants' marks--the nien hao and cycle marks.

The nien hao are dynastic marks, giving the dynasty of a certain ruler during a specific time period, for example, the reign mark of "K'ang Hsi of the Great Ch'ing Dynasty." This is accomplished in six characters, read from right to left and down. The first character (1) reads "Great"; the second (2) "Ch'ing"; the third (3) "K'ang"; and the fourth (4) "Hsi." The fifth (5) and sixth (6) together mean "made during the period." The last two characters are generally found on all dynasty marks (Chaffers 1926:629).

The reign marks may also be found in the square seal form from the beginning of the eighteenth century, either stamped or stenciled.

These seals are in rectangular lines and are difficult to read, even for the Chinese (Caffers 1926:630).

> *On Japanese porcelain the dates are marked less frequently than on the Chinese, but the Japanese nengo, which, like the Chinese nien-hao, is an arbitrary name given to the reign or a portion of the reign of an emperor; but, on the other hand, the names of places at which the wares were made, are often found. The most common mark, however, on Japanese ware is the name of the potter, owing, doubtless, to the individual character given by the Japanese workman to his productions, and to the small size of the factory at which they were made; for in Japan numberless small factories existed, each carried on by a single potter and his own family, and he naturally was proud to add his name as a guarantee of its origin (Chaffers 1926:651-652).*

Usually combined with Chinese reign marks are cycle or year marks. These inscriptions give the exact year the vessel was made. Bushnell (1899:58) gives a list of cycle characters for cycle 44 to 76, or A.D. 4 to 1923.

Sometimes the dynasty indicator of the marks (1) and (2) are omitted; and often reign marks are in a horizontal line (Barber

1910:30). Reign marks may be false, since they were often copied by later potters who produced copies of earlier wares.

Often the mark indicates in which part of the imperial palace the ware was manufactured, such as the "Big Tree Hall," "Rare Jade Hall," "Hall for the Cultivation of Harmony," and so forth. Individual potters' marks are the most difficult to decipher. They may consist of a signature or the potters' name. Both are hard to trace; the time period in which the potter worked is difficult to determine, except by the general style. Jenyns (nd:94-96) states that "the bulk of the imperial wares were contracted out to private kilns, as in the time of the reigns of Lung Ch'ing and Wan Li of the Ming dynasty." These pieces may or may not have been marked with the royal dynasty mark. Later potters who copied the more precious pieces of earlier periods simply placed their own mark on the duplicate vessel.

Marks of dedication and good wishes state simple comments like "great good luck," "double joy," and so forth. Those of commendation read "jade," "ancient," "true jade," and so on. Many symbols were used, such as an incense-burner, a lotus blossom, the hare, palm leaf, "sacred fungus," or some abstract form. As for merchants' marks, the Chinese often copied the manufacture marks of the English or other potters.

Other Ceramic Objects

Clay Pipe. From Structure 4 came the remains of a clay pipe of the "Dublin" style, because the bowl is set at an obtuse angle to the stem (Wilson 1971:18) (Figure 751).

Assay Crucibles. Also from Structure 4 were recovered two sherds from two separate assay crucibles. Ore elements that had been melted in the crucible still clung to the sherds (Figure 75m).

CHAPTER 4

METAL

Products and fragments of iron represent a large portion of the material assemblage recovered from late nineteenth century historical sites. The Iron Age as an aspect of Industrial Revolution did not really arrive in the West until post-1850. Earlier metal objects were largely of copper and alloys of copper. From earlier sites this proportion is lessened further due to the oxidization and deterioration of some metals, particularly iron. Assorted and identical types of metal will corrode at differing rates of time. The rate of corrosion is dependent on numerous factors, some of which are climate, precipitation, humidity, mineral content of the soil, depth below the surface, whether or not affected by ground water, amount of protection by associated artifacts or natural objects, and length of time exposed to such elements.

A possible means of dating iron artifacts may be through the identification of the metal itself. With the discovery of cast iron in the thirteenth century and its general use in the fifteenth century, iron was little improved up to the middle of the nineteenth century (Lilley 1965:61). In the American colonies, iron, mainly wrought iron, was produced in blast furnaces heated by wood chopped from nearby forests. The ore was mined from near the surface of bogs and ponds with the aid of hand tools (Smith 1966:16-17).

The method of producing cast iron is described by Smith (1966: 17-18) as follows:

> *The carbon in the charcoal unites with the oxygen, producing an extremely high heat to melt the ore, but enough carbon remains with the iron to form cast iron; i.e., the iron becomes carbonized in this smelting process. Lime acts as a flux to mix with the impurities in the charcoal and the ore to form slag. While the heavier molten mass of iron settles to the bottom of the furnace, the lighter slag floats on top. This waste product is removed from the surface and the molten iron is run off into molds as pig iron. The term pig is derived from the appearance of the iron being run from the base of the furnace through a main sand mold into several smaller molds: like suckling pigs, feeding from the sow. It took at least six men to work a large blast furnace capable of producing twenty-five tons of pig iron in one week.*
>
> *Iron also could be run off directly into special molds to cast cooking untensils, firebacks, stoves, cannon and shot. Pig iron was suitable for casting into such immediate forms but too brittle for forging by the blacksmith. Wrought iron is a tougher metal with plastic qualities that are necessary in forging the Colonist's tools, kitchen utensils, nails, hinges, latches, lighting devices, horseshoes, plow points, wagon irons, tires, and some weapons.*

> *The pigs or bars that had been cast were further refined to produce this malleable wrought iron in an open forge called a finery or refinery.*

Wrought iron, the earliest type produced, is almost pure and can be identified, according to Aston and Story (1957:46-47), as follows:

> *Deep etching with acid is a prevalent inspection method in the selection of wrought iron products; particularly (1) as a means of disclosing methods of piling, and (2) for the detection of adulteration with steel scrap. Wrought iron etches deeply, with a roughened, stringy or woody surface, whereas steel will show a comparatively smooth surface. The extent to which any product may have been adulterated will often be revealed by the contrast in the etch pattern.*

Bloomery-made wrought iron contained a considerable amount of slag but required cheaper construction and maintenance costs and less skill to manufacture. Consumer satisfaction of such products helped assure production until 1901 (Smith 1966:19). Bloomeries were a primitive method of producing wrought iron by the puddling process. Additional impurities were removed from the iron by hammering the metal into an ingot once it had cooled.

> *Our early settlers valued steel because unlike iron it can be hardened and tempered. Steel was scarce, and until the nineteenth century, very little steel was manufactured. Axes and other edge tools, the faces of hammers, swords and bayonets were forged from steel. Wrought iron could not be hardened because of its extremely low carbon content. By adding a very small amount of carbon to the wrought iron, malleable, strong steel is produced which can be forged, then heat-treated to various degrees of hardness (Smith 1966:19).*

Smith (1966:23), in discussing important discoveries of the 18th century, states:

> *In the eighteenth century England led the world in advancing the techniques of iron manufacturing. Henry Cort received a patent in 1783 to make flat, rough and square bars on the grooved rolling mill of his invention. His machine was an improved type previously used to roll simple forms. In 1766 the Cranege brothers made pig iron into wrought iron in the reverberatory furnaces; based on the reverberatory furnace invented by John Rovenson about 1613 where the fuel was kept separate from the ore. Cort in 1784 improved upon the Cranege process by stirring the molten iron by hand; a method that became known as puddling. Stirring exposed the metal to the flames which burnt out most of the carbon to make wrought iron.*

Steel was little used up to the middle of the nineteenth century. In 1864 the first American steel was poured by use of the Bessemer process. This discovery led to the open hearth production of steel in 1868 (Smith 1966:43).

Lilley (1965) reviews the developments of steel alloys as follows:

> *The characteristics of steel are vastly improved and much greater variety of properties made available by alloying it with small quantities of other metals. Although Faraday had made systematic experiments in this field in 1822, his work did not influence industrial practice and the effective history of alloy steels begins in 1871 with Mushet's invention of a tool-steel containing tungsten, vanadium and manganese, which allowed cutting at much higher speeds. Other alloys followed, such as the high manganese steel of Hadfield (1882) and the nickel steel of Schneider (1888). With the exception of Mushet's tool-steel, these were intended for use in armaments and were only later applied to major constructive purposes. Then in 1898 came the invention of high-speed tool-steel by Taylor and White. . . . Stainless steel was invented by Harry Brearley in 1913.*

R. Forbes (1958:279) gives the following dates in the development of alloys: "tungsten steel (Muchet, 1845), chromium steel (Brustlein, 1878), nickel steel (Marbeau, 1883), manganese steel (Hadfield, 1882), and vanadium steel (about 1914)."

Hadfield's steel was first made in the United States in 1892, shortly after his invention of silicon steel in 1886. The electric arc furnace was first introduced in 1911 and followed by the low frequency, electric induction furnace in 1913 and the high frequency electric furnace in 1930. Although stainless steel was invented in 1913, it was not produced in the United States until 1924 (Smith 1966:36 and 43).

Cartridge Cases

Cartridges (Figure 79), or rather metallic cartridge cases, are usually prevalent in southwestern historical sites, particularly those of the nineteenth century. The headstamp markings provide a convenient means of dating the cases.

The Americans and British measure the cartridge caliber in 100th's or 1000th's of an inch, the caliber being designated by any one of the following criteria (Bearse 1966:15):

(1) Bore or diameter of the barrel.

(2) Barrel-groove diameter.

(3) Bullet diameter.

(4) Inside diameter of cartridge case mouth.

(5) Arbitrary figure, determined by manufacturer.

The caliber may be designated by many means, as listed, and may include the case length or case type. The measuring of cartridge cases with calibers in order to determine specific measurements of given places on the metallic case may prove to be of more value than cartridge-type collections. Many books such as Barnes (1965) give detailed listings of cartridge case measurements which identify a cartridge case very accurately.

Bearse (1966:20) lists four basic types of cartridge cases:

(1) Rimmed (Figure 79a). "It controls headspace by limiting forward movement into the chamber and it provides surface for the extractor to grip."

(2) Rimless (Figure 79b). "The first known successful American rimless cartridge was the 6mm Lee navy 1895 rifle. . . . Headspace is controlled through the shoulder of the case resting against the chamber shoulder."

(3) Semi-rimmed (Figure 79c). "The semi-rimmed or the semi-rimless cartridge is becoming obsolete."

(4) Belted (Figure 79d). "A belted case might be described as a rimless case with a wide belt set back of the extractor groove. The belt controls headspace."

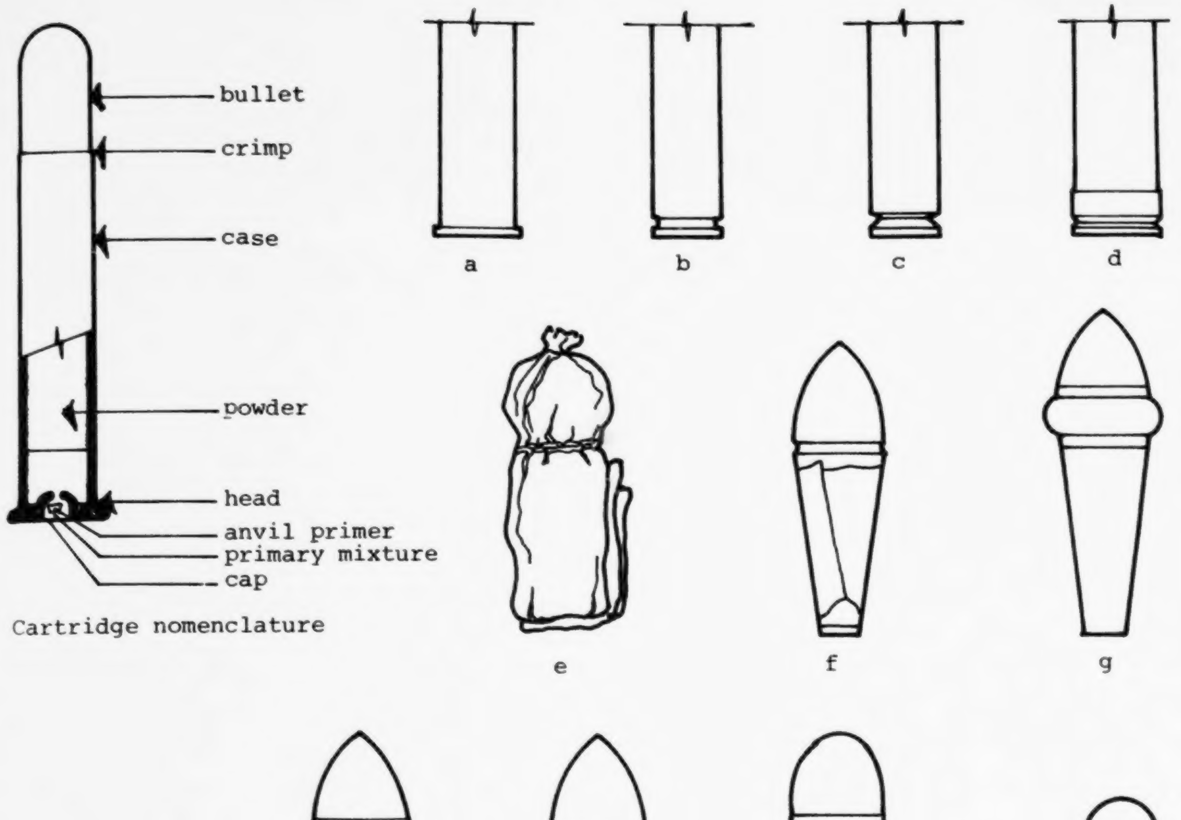
The development of the various cartridge types is outlined by Logan (1959):

(1) Paper (Figure 79e). "Such cartridges were used in match-lock, wheel lock, flintlock and percussion arms of various types. Oftentimes they were greased or oiled, not only to lubricate the barrel, but to protect the powder charge from dampness. Paper cartridges used both round balls and conical bullets for projectiles" (Logan 1959: 12).

(2) Combustible (Figure 79f). "Two developments came in the first half of the nineteenth century. One was the conical bullet, the other the combustible envelope used in the manufacture of cartridges. Together with the newly invented percussion cap, they produced an advance step in cartridge evolution" (Logan 1959:22).

(3) Separate Primed (Figure 79g).

> These separate primed cartridges were ignited from the fire of an ordinary cap, disk primer or tape primer.
>
> First of the metallics of this period were the well known Maynard and Burnside brass cartridges. While they were both separate primed, there the similarity ceased. In appearance they


bullet
crimp
case
powder
head
anvil primer
primary mixture
cap
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b
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Cartridge nomenclature

Figure 79.
Nomenclature of the cartridge, head types, cartridge types and primers (after Logan 1959: 1). Head types: a, rimmed; b, rimless; c, semi-rimmed; and, d, belted. Cartridge types: e, paper; f, combustible; g, separate primed; h, self-contained; i, patent ignition; j, rimfire; k, centerfire - internal primer; and, l, centerfire - external primer. Primer types: m, bar-anvil; n, Benet's; and, o, Berdan.

were as unlike as two cartridges can be. The Maynard was a tubular brass case with a wide flat base soldered to it. In the center was a small pin hole through which the fire from the percussion cap passed.

The Burnside on the other hand has a tapering case not unlike an ice cream cone. Around the bullet was a heavy bulge which was used as a grease chamber. This cartridge, too, had a small pin hole in its inverted base (Logan 1959:30).

(4) Self Container (Figure 79h).

In a way similar to a modern shotgun shell, it had the ball and powder contained in a combustible case. This unit was seated in a brass base in which was placed a detonating pellet in a primer pocket. This head could be reloaded again and again. . . .

Still the experiments went on to develop a cartridge which would be a complete unit. Needle fire cartridges in which the powder, bullet and fulminate were all contained in one unit, were introduced. They were the first complete cartridge to be in general use. Some had the fulminate ahead of the powder and some had it in the base . . . .

An auxiliary chamber provided with a nipple for a percussion cap was a development of this time. It was used both in long arms and hand arms.

Between 1847 and 1850 impetus was given cartridges of this type by M. Houillier. A series of his patents covered the use of metal for complete cartridge cases, irrespective of the type of primer used (Logan 1959:42).

(5) Patent Ignition (Figure 79i).

Into this class fall a number of cartridges of a more or less odd design. Oldest and by far the most generally used is the pin fire, a type which is still in considerable use in Europe and South America. It had a pin protruding through the side of the case near the head. The point of the pin of the inside rested in a percussion cap containing fulminate, which was exploded when the pin received a blow from the hammer (Logan 1959:52).

(6) Rimfire (Figure 79j).

Flobert or France invented the bullet breech cap. . . . In this country Smith and Wesson pioneered by perfecting a revolver to use rimfire cartridges . . . their hinged frame .22 caliber revolver.

B. Tyler Henry was the first to see the possibilities of this new cartridge for larger calibers. He produced a .44 forerunner of the famous Winchester line.

> The first conversions of the percussion muskets of the Civil War to metallic cartridges utilized this then new cartridge. The .58 caliber, one of the largest rim fire cartridges made, is quite a contrast to the earlier .22 short so far as size is concerned (Logan 1959:60).
>
> (7) Centerfire--Internal Primer (Figure 79k).
>
> Taking a lead in experimenting with early centerfire ammunition was the Frankford Arsenal. It was here that many of the early types of centerfire underwent rigid tests. . . .
>
> The bar-anvil cartridge (Figure 79m) was first made at the National Armory, Springfield, Mass., in 1866 for experimental purposes, by E. H. Martin. It was invented and submitted to Col. Benton in June, 1866. . . . This cartridge was replaced by Benet's cup-anvil cartridge (Figure 79n) (Logan 1959:76-77).
>
> (8) Centerfire--External Primer (Figure 79l).
>
> Two types of primers are in use today. The Berdan type in which the anvil is a part of the case itself (Figure 79o), and is formed in the primer pocket. The other, and the one in general use in this country is the type in which the primer contains a separate tiny anvil. The latter type is much easier to remove and reload (Logan 1959:104).

The flat part of the head is usually stamped with the caliber type, manufacturer's name or initials, and sometimes trade names. American military cartridge case heads usually have the initials of the arsenal or ordinance plant where manufactured plus the last two numbers of the year the particular cartridge was made. For example, a head stamp that reads "F 87 R 3" indicates that the case was made at the Frankford Arsenal (F) in March (3), 1887 (87) for a rifle (R). Other Frankmarks are: HP (Hi Pressure Test); NM (National Match); C (Carbine); and RG (Rifle Grenade).

Logan (1959:189-192 and 204) identifies the following manufacturers of headstamps found in the southwest:

DM	Des Moines Ordnance Plant.
DWM	Deutsche Waffen and Munitions Fabriken (Germany).
F; F.A.	Frankford Arsenal (US).
F. (impressed)	Federal Cartridge Co. (rimfire cartridge cases).
F.V.V. & Co.	Fitch, Van Vechten & Co., New York City.
J.G.	Jacob Goldmark, New York (Metallics).

H.	Winchester Repeating Arms (rimfire cartridge cases). In 1866, the New Haven Arms Co. was reorganized into Winchester (1867-present).
H. (raised)	Winchester Repeating Arms (rimfire--early manufacture).
P. (raised)	Phoenix Cartridge Co.
P. (impressed)	Peters Cartridge Co. (1887-1934 absorbed by Remington).
PC CO.; PETERS	Peters Cartridge Co.
RA: RaUMC; REM-UMC	Remington Union Metallic Cartridge Co. (1902-present).
RW	Winchester Repeating Arms Co. (rifle).
U; UMC	Union Metallic Cartridge Co. (before the merger with Remington--1867-1902).
U	Utah Ordnance Plant.
U HiSpeed	Remington UMC (on rimfires since World War II).
U.S.; USC Co.	United States Cartridge Co. (1868-?).
US (raised)	United States Cartridge Co. early.
US	United States Cartridge Co. (intertwined like a $ sign).
WRA: WRA CO; Super Speed	Winchester Repeating Arms Co.
W; W Co.; WCC; WESTERN Super-X	Western Cartridge Co. (1898-present).
1901 NEW RIVAL; 1901 LEADER; 1901 REPEATER; 1901 PIGEON	Winchester Repeating Arms Co.

Cartridges from Simpson Springs

Along the Pony Express Trail and in many other areas in the West, other than towns or cities, a firearm was a necessary weapon. In the remote areas, such as Simpson Springs, a gun was needed for hunting and protection. Pony Express riders, stage drivers, and wagon drivers needed a pistol, rifle, or shotgun for protection of aggression against man or animal. These weapons were probably used for recreation shooting also (Fontana, et al., 1962:79). Remnants of the use of guns is evident in most pre-1900 historic sites in the West.

Two types of cartridges were excavated from the Simpson Springs site: (1) Rimfire, and (2) External Centerfire. Another type also exists, known as Internal Centerfire. A discussion of these types of cartridges is quoted from Berge (1968:212-213): "The rimfire cartridge was invented in France in 1845 but did not come into general use until about 1857 and is still in use today but only on small caliber weapons (Logan 1959:1). Barnes (1965:271) has the following to say about rimfire cartridges:

> *The rimfire differs from the centerfire in that the priming compound is contained in the rim and ignition is obtained by pinching or indenting the rim under the firing pin blow. Rimfire cartridges are of considerable historical as well as practical interest. Although largely a preliminary design leading to the modern centerfire, the principle was so good that many have survived to the present time. The common .22 rimfires had their origin with the Flobert BB Cap in 1845 which led to the Smith & Wesson-developed .22 Short of 1857. The idea of rimfire ignition probably goes back to Roberts' French patent of 1831. This provided for the priming compound covering the entire head; leaving it out of the center would simply evolve into the rimfire. After the Smith & Wesson First Model revolver in .22 Short caliber was introduced in 1857, development of rimfire arms and cartridges was fairly rapid. The New Haven Arms Co. began manufacture of the .44 Henry cartridge in 1861 and the .56-56 Spencer round was made in quantity from 1862, although the rifle dates back to 1860. Both of these cartridges were used by northern armies in the Civil War. The first successful metallic-cartridge repeating arms were chambered for rimfire cartridges. By the end of the Civil War there were numerous different rimfire calibers available.*

After the turn of the century, rimfire cartridges became less and less in demand. Approximately 75 different caliber weapons used rimfires at this time; Remington in 1918-1919 lists about 32, and by 1933 only 17 were listed.

The early (internal) centerfire cartridges were first made in the late 1850s and ceased to be produced in the early 1890s (Logan 1959:1). Logan (1959:7) states that "the patent of the Morse metallic cartridge (1858) with its inside anvil and perforated disk containing a percussion cap marked the first really important step forward in the history of metallic centerfire cartridges." He further quotes from Ordnance Memoranda No. 14, Metallic Cartridges, a publication of the Frankford Arsenal, dating 1873, as follows:

> *Previous to the year 1866 experience in the manufacture of metallic cartridges at this (Frankford) Arsenal was limited*

> *to making a few of the Morse, Burnsides, Maynards and rimfire cartridges for experimental purposes. In the early part of 1864 Col. Laidley, Com'dg., special machinery (draw presses) was introduced preparatory to making cartridges. In 1865, Col. Benet, Com'dg., a few experimental "Gatling" 1 in. caliber rimfire cartridges were made to test the Gatling Gun. In 1866, it being evident that the rimfire would be superseded by centerfire, considerable attention was given to the production of a reliable centerfire cartridge.*

Practically all internal rimfire cartridges have no manufacturer's mark on the base as do the more modern shell cases.

External centerfire cartridges are those shells that make use of a primer located outside the head plate. The internal primer is located inside the cartridge, or on the inside of the head plate.

> *The primer is the heart of the modern centerfire cartridge. It is an amazingly simple device, but took a long time to develop. To paraphrase Webster, a primer is "A cap, cylinder, etc., containing a compound which may be exploded by percussion, friction or other means, used for firing a charge of powder." The primer consists of three essential parts: the cup or container, priming compound and the anvil. The Boxer primer used in the United States is completely self-contained with the anvil a part of the primer. The Berdan primer, preferred in England and Europe, does not contain the anvil; this is provided by a small projection or teat in the bottom of the primer pocket, thus being a part of the cartridge case. The Berdan type is the easiest and cheapest to manufacture, but the Boxer is the best for reloading. In the U.S. reloading of fired bases was of great importance to market hunters, farmers, trappers and match shooters in the early days. For this reason, the Boxer primer rapidly became the most popular type and finally replaced the Berdan altogether. In Europe, manufacturing ease and cost were the principal considerations and the Berdan type won out on that basis. It is an odd twist of history that the Boxer primer was invented by Col. Edward Boxer of the British Army in 1867 and the Berdan type by American Col. Hiram Berdan in 1866. The origin really had little or nothing to do with the preference in primer types. It was a matter of local conditions that dictated the choice (Barnes 1965:301).*

The first external centerfire cartridges differ from the latter in that the former "were made with a balloon type of primer pocket . . . that is, the pocket extended into the powder chamber of the cartridge. . . . This has largely been replaced by the 'Solid Webb,' a head in which the primer pocket is formed in a thicker head, leaving the powder chamber flush across its base" (Logan 1959:194).

Rimfire Cartridges

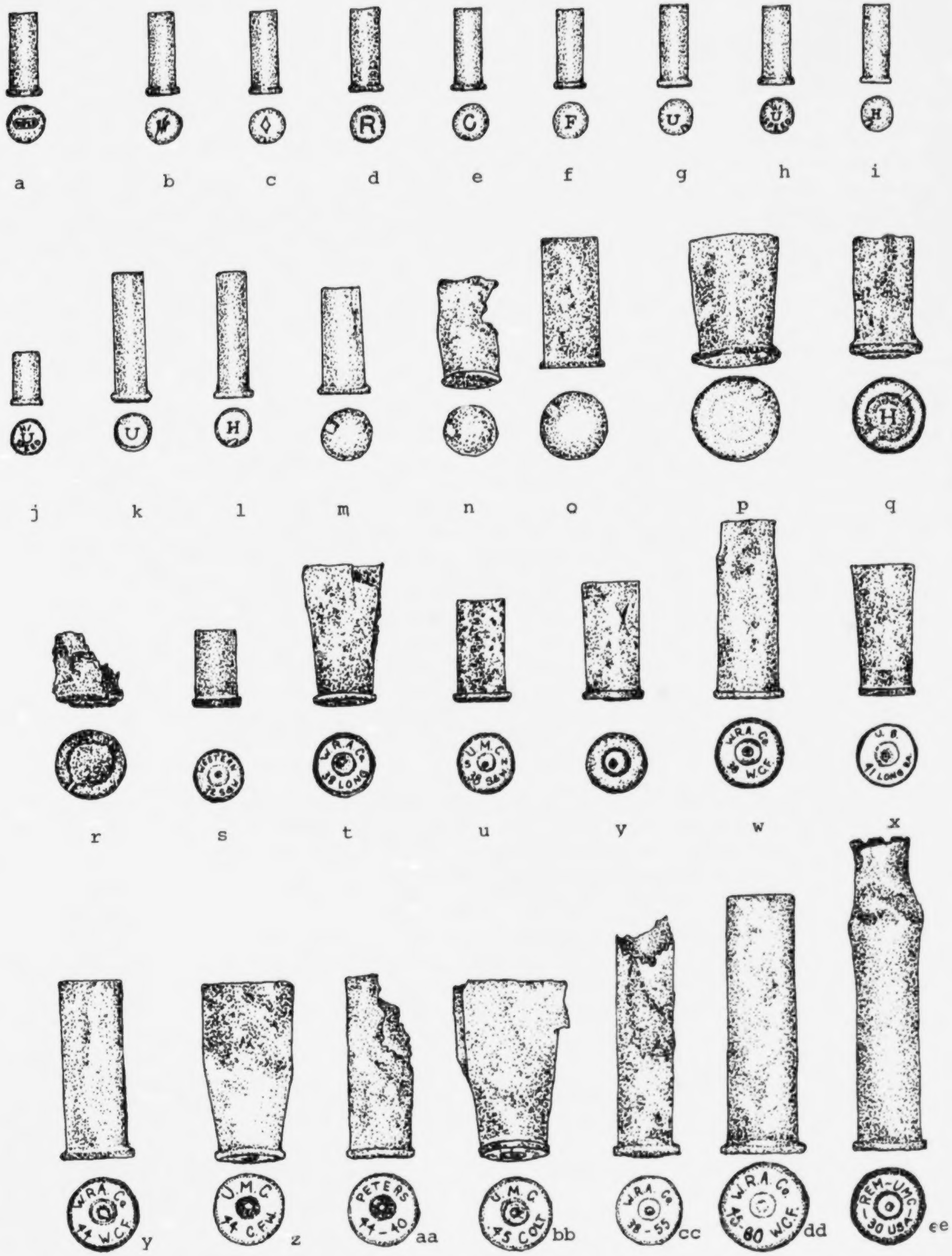
1. .22 Long Rifle--Super-X (Figure 80a). Western Cartridge Company (1900-on). Proveniences: Structure 1, Room 1, and general surface. References: Hackley et al. 1967:297-300; Barnes 1965: 271-275; and Berge 1968:45.
   .22 Long Rifle W (Figure 80b). Winchester Repeating Arms Company (1900-on). Provenience: Structure 1. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.
   .22 Long Rifle (Figure 80c). Winchester Repeating Arms Company (1900-on). Provenience: Structure 1. References: Hackley et al. 1967:297-300; Barnes 1965:271-275; and Berge 1968:45.
   .22 Long Rifle R (Figure 80d). Winchester Repeating Arms Company (1900-on). Proveniences: Structure 1, Room 1, and general surface. References: Hackley et al. 1967:297-300; Barnes 1965: 271-275; and Berge 1968:45.
   .22 Long Rifle C (Figure 80e). Cascade Cartridge Company (1917-on). Provenience: Structure 1, Room 2. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.
   .22 Long Rifle F (Figure 80f). Federal Cartridge Company (1917-on). Proveniences: Structure 1, Rooms 1-2. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.
   .22 Long Rifle U (Figure 80g). Union Metallic Cartridge Company (1890-on). Proveniences: Structure 1, Rooms 1-3. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.
   .22 Long Rifle U HiSpeed (Figure 80h). Union Metallic Cartridge Company (1890-on). Proveniences: Structure 1, Rooms 1-3. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.
   .22 Long Rifle H (Figure 80i). Winchester Repeating Arms Company (1917-on or possibly 1945-on). Provenience: general surface. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.

2. .22 Short U HiSpeed (Figure 80j). Union Metallic Cartridge Company (now Remington) (1930-on). Provenience: Structure 3. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.

3. .22 Extra Long U (Figure 80k). Union Metallic Cartridge Company (1880-on). Provenience: Structure 4. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275 and Sears 1902:323.
   .22 Extra Long H (Figure 80l). Winchester Repeating Arms Company (1880-on). Provenience: Structure 1, Room 1. References: Hackley et al. 1967:297-300 and Barnes 1965:271-275.

4. .32 Long (Figure 80m). Introduced by Smith and Wesson in 1861 for pistols, then rifles were added later. Provenience: Structure 1, Room 1. References: Barnes 1965:277; Berge 1968:214; Schroeder 1971:738 and Sears 1925:271.

5. .38 Short (Figure 80n). 1865 (?)-1940. Proveniences: Structure 1, Rooms 2-3. References: Barnes 1965:278; and Schroeder 1971:738.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W.R.A.Co
38 W.C.F.
x
U.S.
41 LONG DA
y
W.R.A.Co
44 W.C.F.
z
U.M.C.
44 C.F.W.
aa
PETERS
44-40
bb
U.M.C.
45 COLT
cc
W.R.A.Co
38-55
dd
W.R.A.Co
45-80 W.C.F.
ee
REM-UMC
30 USA

Figure 80.
Cartridges from Simpson Springs.

6. .44 Long (Figure 80o). Originated with the Ethan Allen carbine patented in 1860 and became obsolete in the 1920s. Proveniences: Structure 1, Rooms 1-2. References: Barnes 1965:279; Berge 1968:215, Schroeder 1971:738; and Fontana 1962:79-82.

7. .50 Remington Navy (Figure 80p). Made for the single shot, rolling block, Remington Navy pistol of 1865 which became obsolete in the early 1870s. Proveniences: Structure 1, Room 1, and Structure 2. References: Barnes 1965:280 and Berge 1968:217.

8. .44 H (raised) (Figure 80q). New Haven Arms Company (1860-1920) became Winchester Repeating Arms Company in 1866. Cartridge was made until 1934. Proveniences: Structure 1, Rooms 1-2. References: Barnes 1965:200 and Fontana 1962:79-81.

External Centerfire Cartridges

1. .32 S&W Western (Figure 80s). Western Cartridge Company (after 1918). Provenience: Structure 1, Room 1. References: Barnes 1965:154; Berge 1974:194; Hackley et al. 1967:300; Schroeder 1971:738; and Sears 1925:771.

2. .38 Long W.R.A. Company (Figure 80t). Winchester Repeating Arms Company (1875-1900). Provenience: Structure 4. Reference: Barnes 1965:87.
   .38 S&W SH U.M.C. (Figure 80u). Union Metallic Cartridge Company. (Solid Head 1877-1911). Provenience: Structure 2. References: Hackley et al. 1967:300; Barnes 1965:163; Berge 1968:218; Berge 1973:194 and Fontana 1962:79.
   .38 (no mark) (Figure 80v). Possibly from 1875-1876 to 1900. Provenience: Structure 2. References: Barnes 1965:87 and 163.

3. .38 WCF W.R.A. Company (Figure 80w). Winchester Repeating Arms Company. Similar to .38-.40 Winchester (1874-1937). Provenience: Structure 4. References: Barnes 1965:59 and 1965: and Schroeder 1971:738.

4. .41 Long D.A. U.S. (Figure 80x). United States Cartridge Company. Double action 1877-1910. Provenience: General surface. References: Barnes 1965:165; Hackley et al. 1967:300; Fontana 1962:82; and Schroeder 1971:738.

5. .44 W.C.F. WRA Company (Figure 80y). Winchester Repeating Arms Company. Winchester Centerfire (1908-on). Proveniences: Structure 2, Structure 3, and Structure 1, Room 1. References: Barnes 1965:194; Hackley et al. 1967:266; and Fontana 1962:8.
   .44 C.F.W. U.M.C. (Figure 80z). Union Metallic Cartridge Company. Centerfire Winchester (?) 1908-1911. Provenience: Structure 4. References: Barnes 1965:104 and Hackley et al. 1967:266.
   .44-40 Peters (Figure 80aa). Peters Cartridge Company (1870-modern). Provenience: Structure 4. References: Barnes 1965: 104 and 365; Hackley et al. 1965:299; Schroeder 1971:738; and Montgomery Ward 1932:480.

.44-40 U.M.C. Union Metallic Cartridge Company (1878-1911). Provenience: Structure 4. References: Fontana 1962:81; Hackley et al. 1967:300; Schroeder 1971:738; and Sears 1925:771.

6. .45 Colt U.M.C. (Figure 80bb). Union Metallic Cartridge Company (1873-1911). Provenience: Structure 4. References: Barnes 1965:172 and Hackley et al. 1967:11-20 and 300.

7. .38-55 S.R.A. Company (Figure 80cc). Winchester Repeating Arms Company. Provenience: Structure 4.

8. .45-60 W.C.F. WRA Company (Figure 80dd). Winchester Repeating Arms Company. Winchester Centerfire 1880-1935. Provenience: Structure 4. References: Barnes 1965:110.

9. .30 USA REM-UMC (Figure 80ee). Remington-Union Metallic Cartridge Company (1911-modern). Provenience: Structure 4. References: Barnes 1965:79 and Hackley et al. 1967:300.

10. .30-.30 U.M.C. (Figure 81a). Union Metallic Cartridge Company (1895-1911). Provenience: Structure 4. References: Barnes 1965:34; Fontana 1962:79; and Schroeder 1971:739.

11. .38-.40 (no marks) (Figure 81b). Probably introduced about 1875. Provenience: Structure 1, general surface. Reference: Barnes 1965:88.

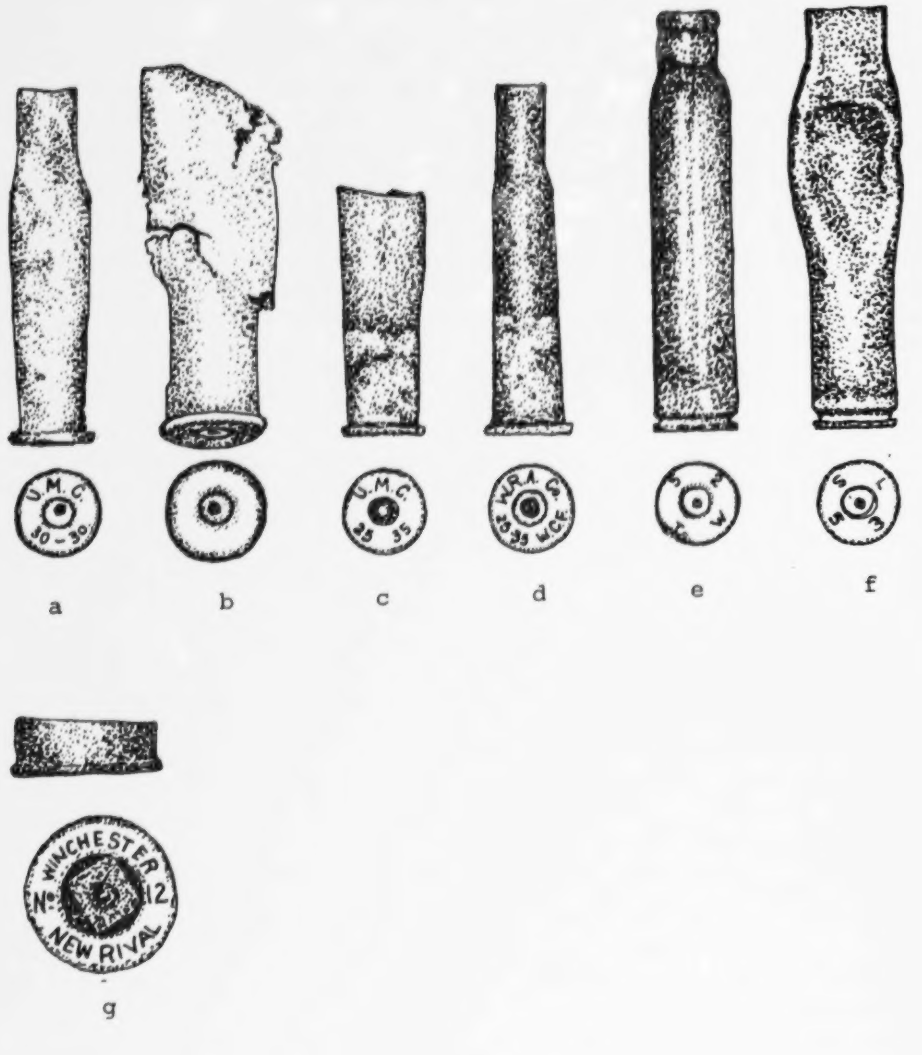
12. .25-.35 U.M.C. (Figure 81c). Union Metallic Cartridge Company (1895-1911). Provenience: Structure 3. References: Barnes 1965:21; Hackley et al. 1967:300; and Schroeder 1971:739.
.25-.35 W.C.F. WRA Company (Figure 81d). Winchester Repeating Arms Company (1895-1945 rifle discontinued). Proveniences: Structure 1, Room 1, Structure 2 and Structure 4. References: Barnes 1965:21 and Schroeder 1971:739.

13. .30 T W 2 5 (Figure 81e). Winchester Repeating Arms Company. Pre-World War I. Provenience: Structure 1, Room 1. References: Hackley et al. 1967:99-193 and 300.
.30 S 5 3 L (Figure 81f). United States Cartridge Company (Lowell Cartridge Company) Pre-World War I. Provenience: Structure 1, Room 1. References: Hackley et al. 1967:99-193 and 300.

Shotgun Shell

Barnes (1965:284-285) provides the following brief historical account of the development of the shotgun:

> *Modern shotguns, double or single, date back to around 1750. There were, of course, flintlock and later percussion fired. The Lafaucheaux pinfire was patented in 1836 and this shotshell type is still manufactured and used in parts of Europe. The first successful, commercial, self-contained ammunition was*


U.M.C.
30-30
U.M.C.
25 35
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25-35 W.C.F.
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WINCHESTER
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g

Figure 81.
Cartridges from Simpson Springs.

> *for these early breech-loading shotguns. In 1851, Charles Lancaster in England brought out an improved, centerfire type breech-loading shotgun and this marked the end of the muzzle-loader. However, the front-loading shotgun died hard and many hunters preferred them well past 1900. Choke boring was undoubtedly used, but was little known prior to 1870. In that year, it was further developed and publicized by Fred Kimble here in the United States and then gradually evolved to its present state. The 1864 Schuyler, Hartley and Graham catalog illustrates several breech-loading shotguns. The 1884 Kynock catalog lists center- and pinfire shotgun shells ranging from 4- to 20-gauge.*
>
> *The first commercially successful smokeless powder was developed for shotgun shells under 1864 patent of Prussian Captain E. Schultz. It wasn't until 1885 that smokeless powder burned too fast and built up excessive pressure for rifle use. Schultz's powder was made from nitrated wood pulp and Du Pont manufactured it in the U.S. for many years. The British were still using it up to about 1939. Modern shot of uniform quality came into being when the Englishman William Watts discovered the advantages of dropping shot from a tower in 1769.*

No. 12 New Rival Winchester (Figure 81g). Winchester Arms Company (1901-modern). Provenience: Structure 4. References: Barnes 1965:288 and Berge 1968:221.

Horse Trappings

Included in this section are those artifacts which man used to maintain his horses. Among the Simpson Springs artifacts are: horseshoes, buckles, rings, a curry comb handle, a harness snap, a single tree clip, a branding iron, and a sheep shear. This latter object may not be directly related to horses, but for convenience is included here with the animal paraphernalia.

Horseshoes

There is more to horseshoeing than attaching an iron shoe to the hoof. The object of shoeing is (1) to adapt the horse to a different environment by avoiding excessive wear of his natural feet; (2) to avoid slipping and falling, especially during winter months; (3) to correct abnormal limbs; and (4) to cure diseases of the feet (Lungwitz 1908:11). Each horse has to be fitted to its own particular pair of shoes; therefore, the horseshoer must know not only how to apply the shoe, but how to recognize and correct abnormal feet, as well as the treatment of normal feet.

History of Horseshoeing

The art of shoeing the horse to prevent lameness caused by excessive wear probably had its beginnings well before the first century A.D. Shoeing may have started in those areas which are least like the horse's natural environment. In open country, like the Asian deserts, shoes were seldom needed, and it was only after man confined the horse to hard soils or heavy work that shoeing became necessary (Vernam 1964:230). By 400 B.C. the Greeks had many fine horses in use by the cavalry, who did not shoe them. In consequence, many became lame during the latter part of the Pelopeonnesian War, as described by Xenophon (Ridgeway 1905:298). The first shoe was made of rawhide, which Vernam (1964:230) describes: "A circular piece of hide was cut to the proper dimensions, with a series of holes punched around the edge. When soaked soft it could be drawn snugly around to shape." In some areas of the Orient the feet were covered with plaited straw (Vernam 1964:230).

The Greeks in Aristotle's time used boots to protect the feet of camels (Anderson 1961:91), and later metal was attached to the sole of the boot and trimmed with gold and silver.

Evidently the Romans copied this same type of metal-soled boot from the Greeks (Vernam 1964:230), and such boots were quite common from the first century B.C. (Anderson 1961:91). It was probably the Romans who introduced the boot shoe into England in 55 B.C. (Vernam 1964:230). As for metal shoes, Vernam (1964:23) states:

> *While certain researches have indicated that all-metal shoes may have been in use as early as 320 B.C., the first authoritative appearance was around A.D. 481. A shoe taken from the tomb of the French knight Childeric is quite modern in design. If it did belong to that early knight, its similarity to later shoes would indicate it was an adaptation from an earlier type rather than an original. Even horseshoes must have a trial-and-error period of evolution. To find such a finished example in Childeric's time suggests that experimental models must have appeared many years previously. However, horseshoes did not become common in Europe until around 900.*

The initial use of horseshoes for military animals is described by Evans (1966:32) as follows:

> *The first official mention of horseshoes as a definite part of military equipment comes from the ninth century A.D. during the time of Emperor Leo VI, who ruled the Eastern Roman Empire from Constantinople. Leo's cavalry units were each supplied with 'lunar or crescent-shaped iron shoes and their nails' for the horses' feet. Leo's son, the Emperor Constantine, further standardized shoeing technique by specifying the weight of iron to be issued from imperial magazines for the making of horseshoes.*

Horseshoes of the fifteenth century were "made from a broad and stout piece of iron which tapers toward the ends of the branches. The calkins are raised, not rolled over; there are three square-shaped nail-holes on each side of the shoe. The large heads of the nails would project to the level of the calkins" (Murray 1937:136).

Vernam (1964:230) describes the use of shoes in the New World by stating:

> *When the conquistadors came to America, they immediately found themselves faced by a dearth of iron to shoe their most essential horses. During their early years in Mexico they tried using the abundant silver for horseshoes but found it too soft to make a suitable substitute for more durable material. As they had no other metal, they reverted to the ancient method of covering their horses' hoofs with rawhide.*
>
> *The Indians of the southwest, who got their horses from the Spaniards, adopted this method of rawhide shoeing whenever protection of their mounts became necessary. They passed it on to the Indians farther north until it became a common practice with all the American tribes.*

Characteristics and Nomenclature of the Foot and Horseshoe

In its wild state, the natural environment of the horse is quite different from that provided by man. The horse is a vegetarian and feeds upon grasses growing in areas where semisoft soils provide adequate nourishment for its maintenance. Horses are also gregarious animals and therefore travel in large herds; thus food for such herds would have to be sought in large quantities. The natural environment for horses then would be in meadows and valleys where the soil is rich and well-watered, thereby providing abundant pasturage. Under these conditions the hoofs need not be shod, since there is a balance between hoof wear and growth (Holmstrom 1904:135).

The normal hoof grows about four inches a year; the heels grow about one-third of an inch more than the toes (Hayes 1960:565), thus providing adequate protection to the softer parts of the foot as wear progresses.

The natural environment of the horse changes considerably in most cases when the animal is domesticated. Whereas the horse had adapted to firm soils, he must now walk on harder surfaces, even stone, under the burden of additional weight. These changes cause hardships on the horse--his back is strong, but due to wear on the horny part of the hoofs, his feet are extremely weak. As the horny protective covering of the hoof wears away, it exposes the soft, fleshy parts of the foot. When this happens the horse becomes lame and cannot be used as a burden animal. The horse has to be able to go where man needs his services, so a means had to be developed to prevent rapid wear and man has developed artificial, adaptive means to prevent the gradual grinding away of the horses' hoofs.

The Foot

The bones of the lower leg that connect to the foot and are important to the manipulation of the foot are the cannon bone, and the long pastern and short pastern bones. The foot houses two bones: the coffin bone and the navicular bone (Linfoot 1960:10). The joint where the cannon bone and long pastern meet is the fetlock and the area between the fetlock joint and the foot or hoof is called the pastern (Linfoot 1960:5). The top part of the foot where the hoof and pastern meet is the coronet (Holmstrom 1904:139). The protuberance to the rear of the hoof and just above the coronet is termed the bulb (Armistead 1960:10).

Martin (1907:103) considers the foot "one of the most highly organized parts of the horse's anatomy. It is a combination of bones, cartilages, tendons, nerves, and blood vessels, enclosed in skin, hair, and a tough, elastic envelope. The hoof is a horny crust, very dense on the outer surface, while the interior is made up of thin plates or laminae, by which it is attached to the coffin bone." Those parts of the foot which come directly in contact with the ground are the frog, bars, sole, and wall (Figure 82a) (Linfoot 1960:4). These are the main protectors of the foot (Martin 1907:103). The frog is a fibrous, elastic body that, along with the planter cushion, prevents injurious jars to the legs when the feet come into contact with the ground. The frog is located at the heel or back of the foot and at the horny surface is shaped somewhat like a heart. The frog comprises most of the foot's volume. The sole, the bottom of the foot, is also fibrous and flakes off at the white line where the sole and wall meet (Holmstrom 1904:138). Around the sole and part of the frog is the wall or horny wall which encases and protects the remainder of the foot (Linfoot 1960:5). It is to this wall that horseshoes are attached. Holmstrom (1904:137-138) states that

> *the growth of the wall is different at different ages. It grows more in a young horse and colt than in an old horse; in a healthy foot and soft, than in a diseased foot and hard. In a young horse the hoof will grow about three inches in a year and even more, while it grows less in an old horse. The wall is fibrous, the fibers going parallel to each other from the coronet to the ground.*

The grounding-surface of the foot consists of three sections: the heel, quarters, and toe (Linfoot 1960:4) (Figure 82b). The heel is that portion of the foot posterior to the tip of the wall buttress or about the latter third of the foot. The anterior portion of the foot contains the quarters and toe.

The shape of foot determines the shape of the shoe, and since there are many different forms of hoofs, there are equally as many types of shoes (Lungwitz 1908:101). In the normal hoof "the outer wall is a little thicker and somewhat more slanting than the inner, and its outer circumference describes a larger arc of a circle, that is, is more curved" (Lungwitz 1908:68). "In the fore feet the hoof is thickest in the anterior portion, but in the hind feet, the greatest thickness of horn is in the quarters and posterior part" (Martin 1907:104). The toe of the hoof should form an angle of 45° to 50° with the ground and the wall parallel with the pastern. In other words, the pattern forms the same angle as the toe (Lungwitz 1908:68).

In the standing position there are three primary forms of the hoof: (1) the base-wide hoof; (2) toe-wide hoof; and (3) the base-narrow

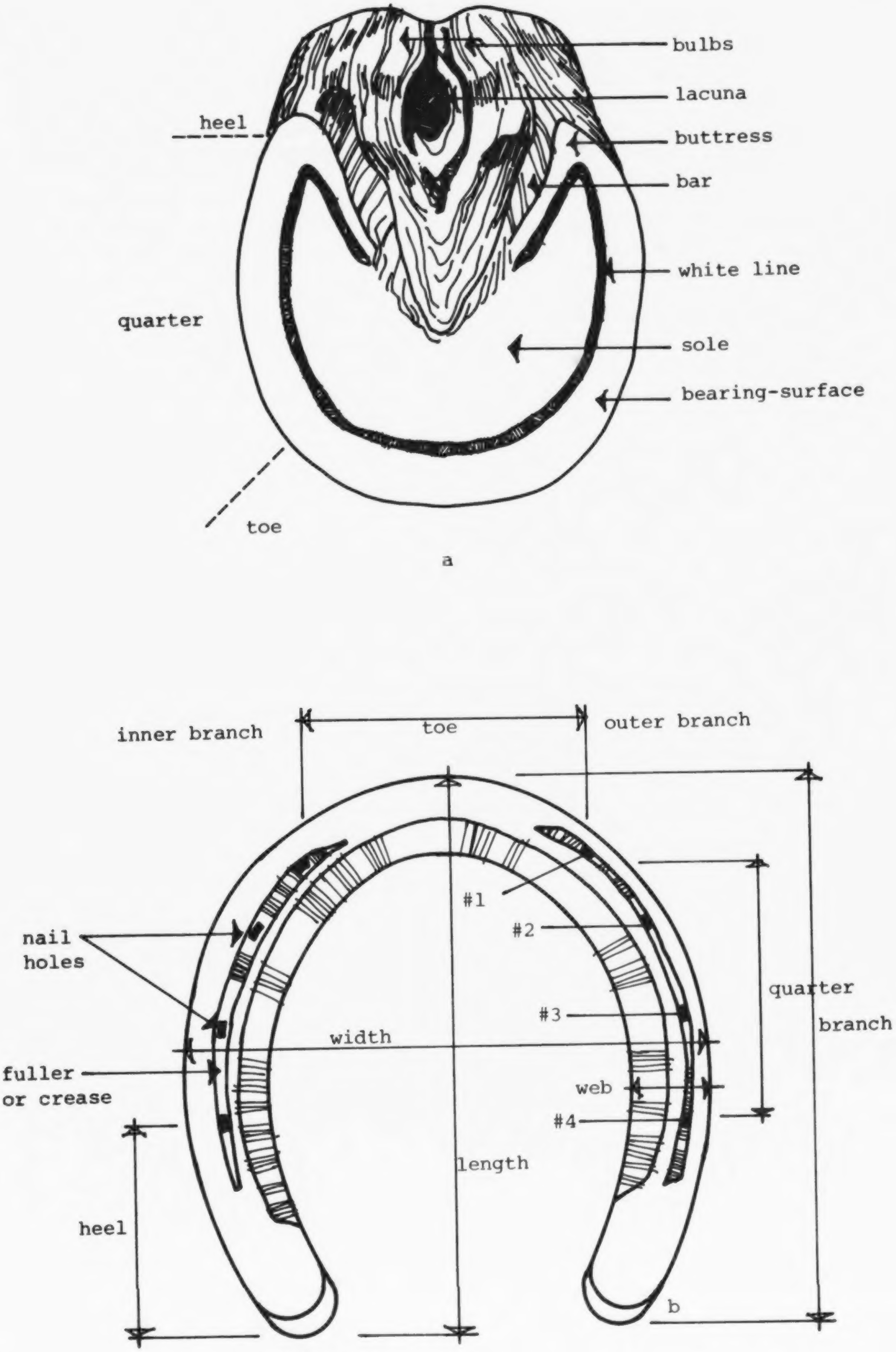

bulbs
lacuna
heel
buttress
bar
white line
quarter
sole
bearing-surface
toe
a
inner branch
toe
outer branch
#1
#2
nail
holes
quarter
#3
branch
width
fuller
or crease
web
#4
length
heel
b

Figure 82.
The hoof and the horseshoe.

hoof (Lungwitz 1908:68). A base-wide hoof has a longer and more slanting outer wall; therefore the outer half of the sole is wider (Lungwitz 1908:69). In the toe-wide hoof "the inner toe and outer quarter, lying opposite each other, are much less sharply bent or curved. The toes are turned out. The feet are not set down flat upon the ground, but meet it with the outer toe" (Lungwitz 1908:69). The base-narrow hoof is similar to the regular hoof "except that the inner side wall and quarter are a little more sharply curved in a base-narrow hoof. Occasionally the outer quarter is somewhat drawn in under the foot" (Lungwitz 1908:70).

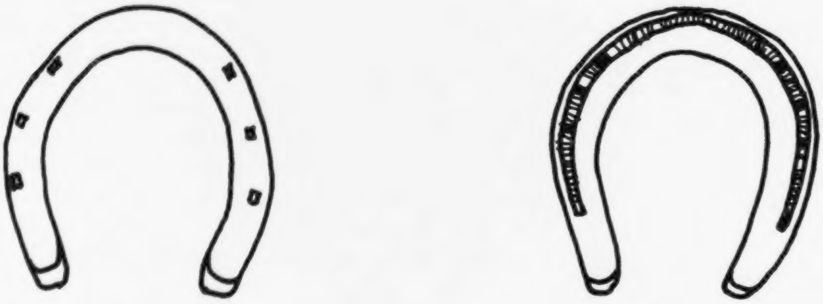
Concerning the hind hoofs, Lungwitz (1908:70-71) states:

> *The hind hoof is not round at the toe, but somewhat pointed or oval. Its greatest width is between the middle and posterior thirds of the sole. It usually has a strongly concaved sole and a somewhat steeper toe than the fore-hoof; viewed from the side, the angle of the toe with the ground in the regular standing position is from fifty to fifty-five degrees.*

The Horseshoe

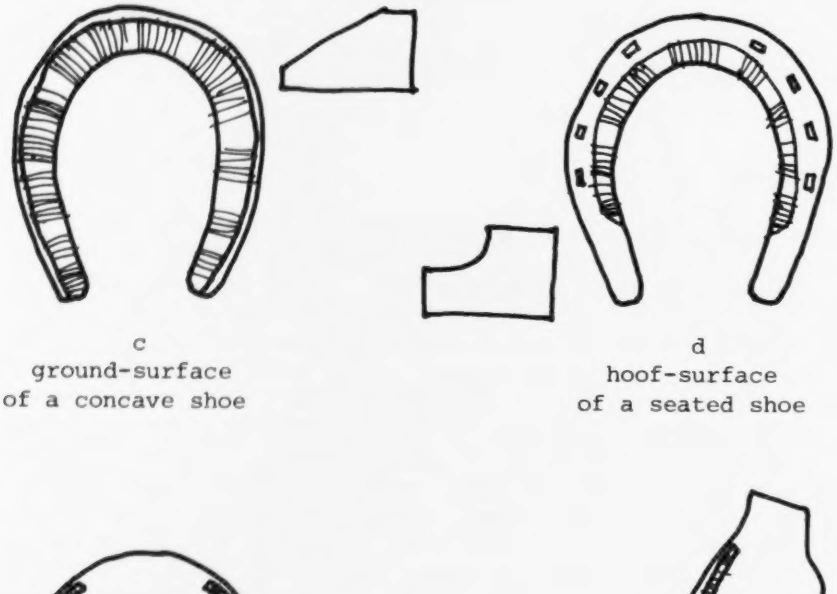
The normal horseshoe (Figure 82b) has the form of a constricted arc with the same three general sections as the foot, i.e., toe, quarter, and heel. The area from the toe to the heel on each side of the shoe is termed a branch or wing (Great Britain 1908:227). These branches can be either inner or outer, depending on the position of the shoe in relation to the body median. The area of the shoe which comes in contact with the ground is the ground-surface, and the opposite side is the hoof-surface. That portion of the hoof-surface which comes into direct contact with the hoof is the bearing-surface. The crease or fuller is always located on the ground-surface, as is the concave (Figure 83c) of the shoe, while seating (Figure 83d) is found only on the hoof-surface (Lungwitz 1908:90). The fuller is a groove which usually extends the length of the quarter but may include the entire arc of the shoe, from heel to heel. Nail holes are punched into the fuller, and this groove prevents the wearing away of the nail-head, thereby preventing untimely loss of the shoe. The fuller also prevents slipping and aids the farrier in punching the nail-holes more easily and accurately (Fitzwygram 1903:479). Seating is used to take the pressure off the sole in order for the wall to take the entire pressure of the horse's weight. The "web" of the shoe (width of a branch) is "the whole of the substance of the shoe . . . and the width of the web, cover, e.g., a wide-webbed shoe, is frequently spoken of as having 'plenty of cover'" (Great Britain 1908:227).

Normal front shoes are easily distinguishable from normal hind shoes. The front shoes (Figure 83c) are more nearly circular at the toe and quarters, and are usually wider at the heels. The hind shoes (Figure 83a) are more pointed at the toe and quarters, and usually narrower at the heels (Hayes 1960:448). Hayes (1960:448) points out that "since the outside wing or web of a hind shoe is always longer



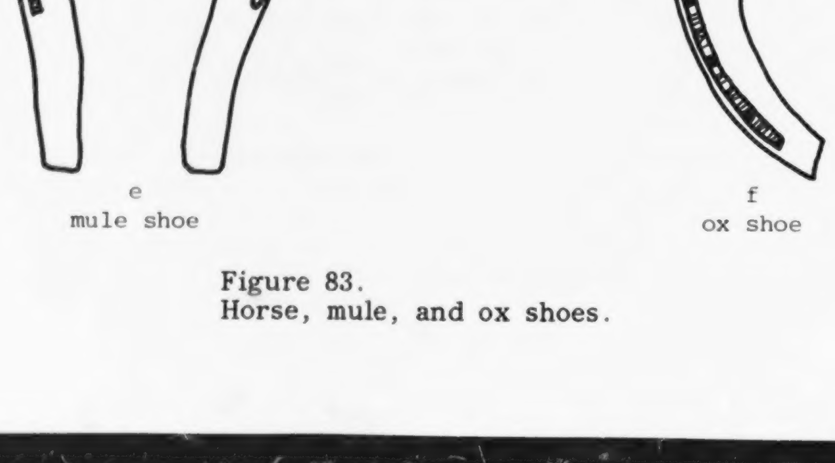
a
hind shoe

b
front shoe



c
ground-surface
of a concave shoe

d
hoof-surface
of a seated shoe



e
mule shoe

f
ox shoe

Figure 83.
Horse, mule, and ox shoes.

than the inside web, it is easy to distinguish the difference between left and right rear shoes." Hayes further states that

> *The hoof wall is thicker at the toe than at the heels of the foot; hence the web of the shoe is usually wider at the toe than at the heels. The shoe should be so placed upon the foot as to permit the hoof wall to function as a weight-bearing agency from toe to heel.*
>
> *The wings of the front shoe should be long enough to reach the bulbs of the heel and provide support for the hoof wall, but not so long that a hind foot can come in contact with them and pull them off. Usually the wings of the hind shoes are a little longer than the wings of the front shoes. Especially is this true of the outside wing of the hind shoe, on which a low heel calk is sometimes used. This extra length on the outside wing of the hind shoe gives a little more support to a hind foot, the low heel calk raises the outside of the foot a little and tends to throw the hocks closer together to produce more collected action.*

Added to the normal horseshoe are special features used to correct imperfections of hooves or gait. Armistead (1960:13) states that "corrective horseshoeing includes not only shoeing to improve or to correct defects resulting from inherited, conformational faults, it includes also shoeing to alleviate pain and to encourage healing in diseases and injuries of the feet and lower legs."

Forging, also called clicking, or overreaching, is a gait fault wherein the toe of the hind foot comes in contact with the heel of the front foot of the same side, usually occurring when the horse is trotting (Hayes 1960:201). Cross-firing, which occurs more among pacers, is essentially the same as forging except that it is the diagonal hooves that make contact (Armistead 1960:14). A common way to remedy this fault is to change the weight of the shoes (Figure 84a-b) (Holmstrom 1904:143). Clips (Figure 85a) are a common device used to prevent cracking of the hooves when the feet come into contact when forging occurs (Lungwitz 1908:116); or a grab (Figure 84b) may be used (Armistead 1960:14). Also, "clips are useful as a means of fastening the shoe more securely, and of diminishing the number of nails. They are particularly desirable on heavy draft horses employed on paved streets" (Martin 1907:107).

Weight of the shoe may be changed by altering the shoe or adding to it, or the weight may be held constant but redistributed to correct some foot abnormality. One method of changing the balance of the shoe by adding weight is to extend one branch or both, depending on necessity. This extension is called a trailer (Figure 84c). "The horse, like man puts his heel down first, longer shoe heels strike the ground sooner, braking the foot and shortening the stride." When additional breadth is added to one of the branches, it is called a lateral extension (Figure 84d); and when one branch is reduced by removing the fuller, it is termed dropped-crease or spared branch (Figure 84d) (Armistead 1960:13-14). "Knocked up," or

> *"Feathered-edged" shoes have the inner branch of the web considerably narrowed from the toe to the heel, and at the*

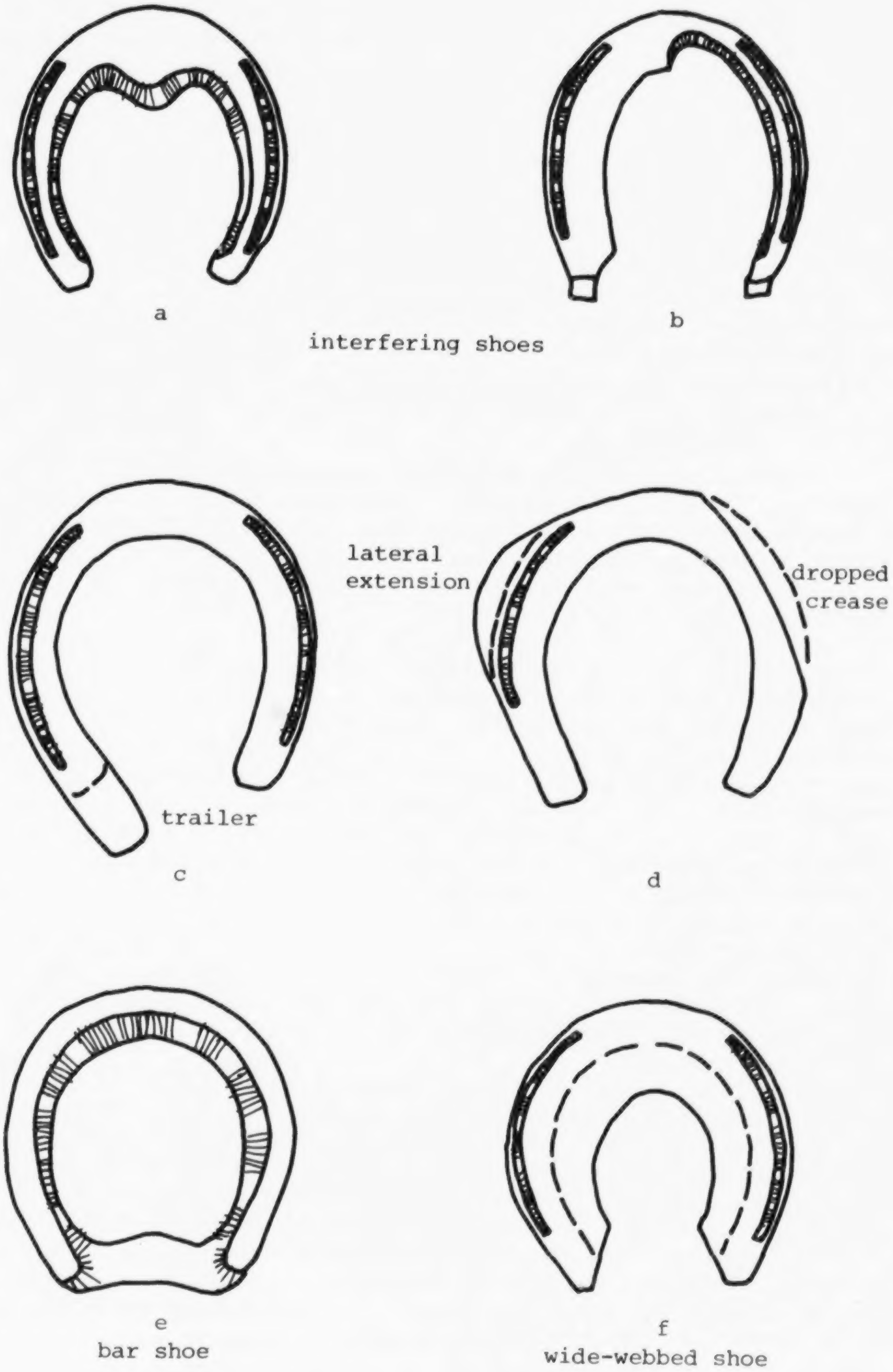
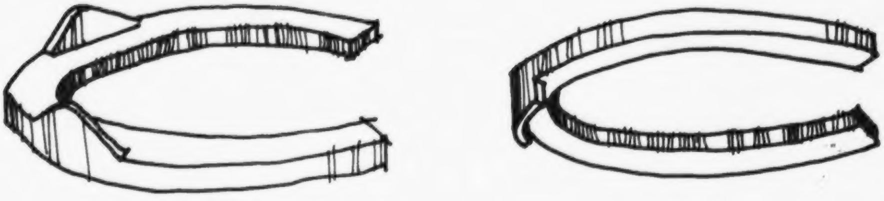
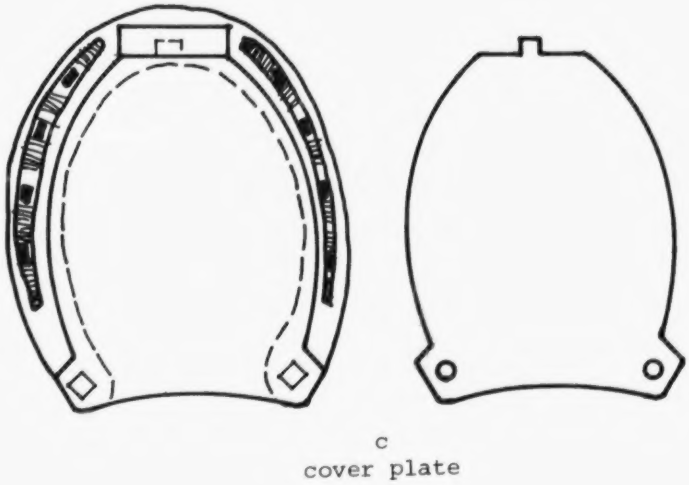

a
b
interfering shoes
lateral extension
dropped crease
trailer
c
d
e
bar shoe
f
wide-webbed shoe

Figure 84.
Types of corrective horsehoes.

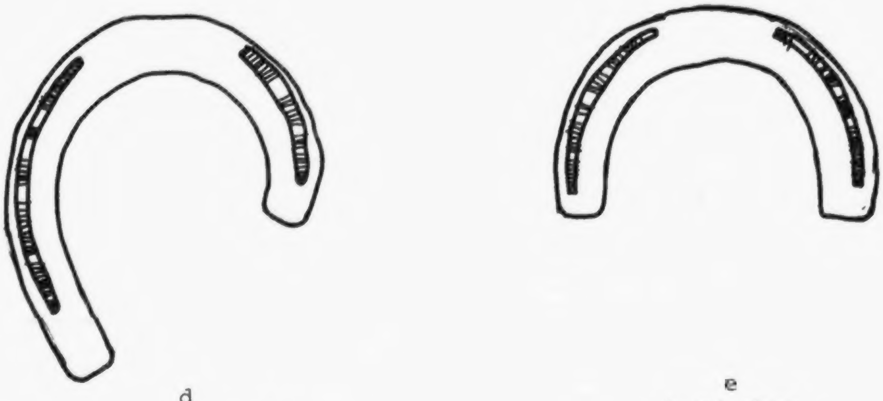


a
clips

b
toe grap



c
cover plate



d
three-quarter shoe

e
half shoe

Figure 85.
Corrective features of horseshoes.

> *same time slope inwards under the hoof. They are used for horses which 'brush.' When the animal turns the toes out from the fetlock, the knocked-up side is also made deeper than the other, with the object of throwing the weight on the outside of the foot and so straightening the leg at the fetlock, when the body weight is on it (Great Britain 1908:230-231).*

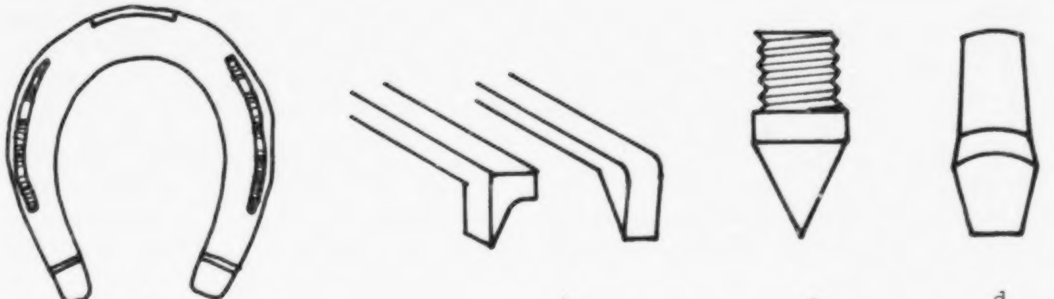
Some shoes have bars crossing the shoe from branch to branch that are used to apply pressure to the frog and to strengthen the branches (Figure 84e) (Kays 1953:459). A shoe with the web broadened on the inside (wide-webbed shoe) (Figure 84f) protects and supports the fallen sole (Armistead 1960:15). When a pressure-dressing is necessary for protection of the sole or frog, a cover-plate (Figure 85c) is applied to the shoe (Lungwitz 1908:145). A beaked shoe has the toe extended out and then bent back to touch the hoof, preventing a forward movement of the foot (Armistead 1960:13). A slight upward turn of the toe, called a rolled toe, "facilitates the 'breaking over' of the feet, and insures a uniform wear of the shoe" (Lungwitz 1908:104).

These same features of the shoe are used to correct diseased feet. Sandcracks are splits in the horny wall of the hoof. Clamps are often used to close the crack and prevent further splitting (Holmstrom 1904:158). A special type of shoe, the sandcrack clamp shoe, is also used to prevent further cracking (Lungwitz 1908:157).

The calk (calkin or caulk) is a protrusion from the flat ground surface of the shoe (Figure 86). Martin (1907:107) states that calks "should be of equal length at toe and heels, otherwise an unequal strain is thrown upon tendons and ligaments, terminating sooner or later in serious injury to the extremities." Calks are used for gripping the ground-surface, primarily in the winter on ice (Lungwitz 1908:119). There are two main types of calks: (1) forged (Figure 86c), which are part of the shoe; and, (2) applied, which are added to the shoe. Of the latter type, there are two types of application, namely screw-calks (Figure 86c) and peg-calks (Figure 86d). There are several particular forms of calk heads: rectangular, ovoid, semi-circular, square, and so forth, depending on the needs of the employed horse (Lungwitz 1908:125). Special calk heads include the corner calk, star calk, hollow calk, perforated calk, etc. (Lungwitz 1908:128-129 and Frikart 1933:137-139).

The largest single cause of shoe loss is faulty nailing (Fitzwygram 1903:479). Nails should be "slender, wedge-shaped, and twice as wide as they are thick" (Lungwitz 1908:109). The size of nail (Figure 87) utilized depends on the size of the foot, weight of the shoe (Fitzwygram 1903:476), and also the type of work expected of the horse (Martin 1907:107). For the normal hoof, the nail should be three-tenths of an inch from the outside of the shoe on the foot-surface (Hayes 1960:576). Nail-holes are punched at a slight inclination through the shoe so that the nail will pierce the side of the hoof without pricking the sensitive sole (Fitzwygram 1903:477). Pricking means that the soft tissue of the sole has been penetrated (Great Britain 1908:239).

There are hand-made and machine-made horseshoe nails, both of which have their specific advantages and disadvantages (Lungwitz 1908:109). There are two primary types of nails: (1) rose-headed nail

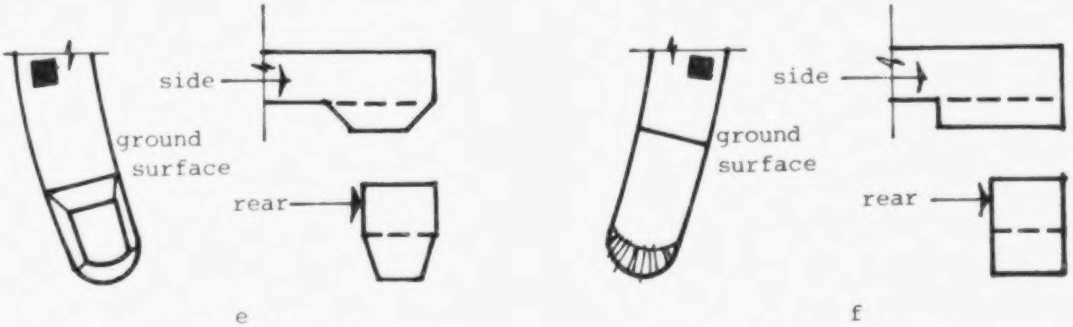


a
hind shoe with calks

b
outer and inner
heel calks; sharpened

c
screw calk

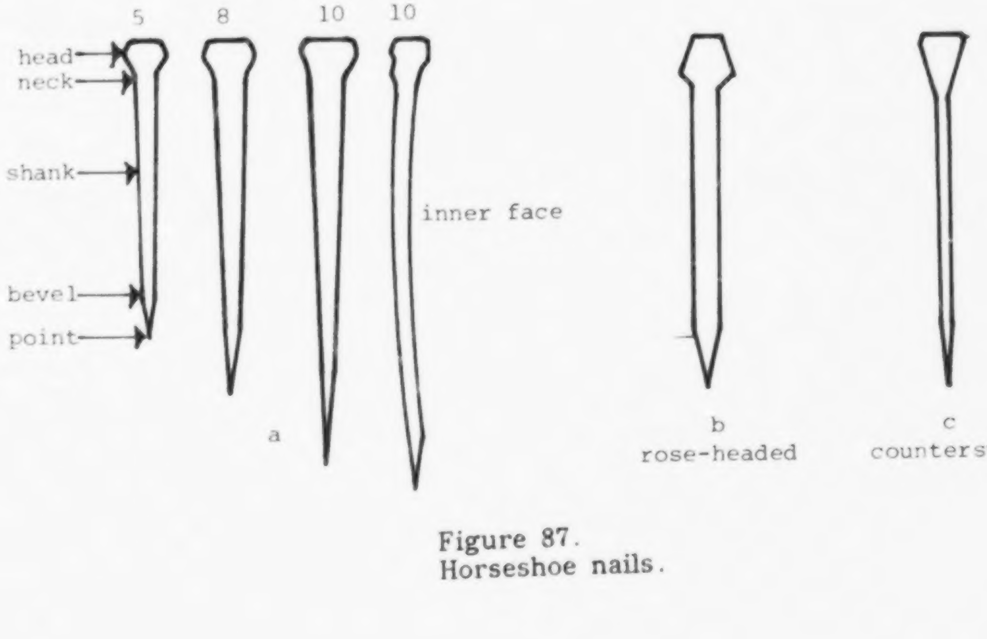
d
peg calk


side
ground
surface
rear
side
ground
surface
rear

e
narrow forged calk

f
wide forged calk

Figure 86.
Horseshoe calks.


5
8
10
10
head
neck
shank
bevel
point
inner face

a

b
rose-headed

c
countersunk

Figure 87.
Horseshoe nails.

(Figure 87b); and (2) countersunk nails (Figure 87c). Rose-headed nails are employed with shoes that have not been fullered; the head does not enter the nail hole. Countersunk nails are embedded into the web, having either a half or full counter (Great Britain 1908:233). There are also frost-nails (edged like a screwdriver) used in the winter to perform the same task as a calk (Lungwitz 1908:119).

As a general rule there should be as small and as few nails as possible (Martin 1907:107). "A nail larger than necessary is objectionable, because it needlessly damages the crust, and besides requires a larger hole, which obviously must weaken the shoe" (Fitxwygram 1903: 476).

Hayes (1960:476) states that

> *thin shoes, especially if they be of soft iron, should be fullered; for if this be not done, and the nail driven flush with the ground surface of the shoe, the nail hole will soon become too big for the head of the nail. If, however, the nail heads project beyond the ground-surface of the shoe, they will quickly get worn down or knocked off: the result being, in either case, that the horse will drop his shoe. With a fullered shoe, though the heads of the nails are larger than the nail holes, they will lie protected in the groove.*
>
> *If a shoe is made of hard iron and has plenty of substance it should not be fullered; if this be done, it will be difficult to alter the distance of the nail-holes from the outer edge if required. The holes should be punched square and made to narrow downwards (looking at the shoe when the foot is 'picked up'). The square cavity, wide at the top and tapering to the bottom, gives a secure and solid lodgment to the nail head, which, of course, should be of the same shape; it does not weaken the shoe, is easily made, can be placed near the outer or inner margin as required, and when filled with the nail is as capable of resisting wear as any other part.*

Elaborating further, Kays (1953:449) writes,

> *In every job of shoeing, the number, the depth, and the distribution or placement of the nail holes is very important. The nail holes must be so placed that the nails can be driven into the hoof without being driven into the sensitive tissues of the feet, called driving the nails 'too green.' The nails should be so punched as to permit the driving of the nails without interference with the expansive mechanisms of the feet. Finally, the nails should taper from the ground to the hoof surface, all of them driven at about the same angle so that when they are clinched none of them will have been driven too green and cause blood poison, nor will any of them have been drawn so tight as to cause painful compression.*
>
> *In the case of shoes of medium weight, six nail holes are sufficient. With heavier shoes, especially those with toe and heel calks, eight nails may be necessary. The rear nail holes in front shoes are driven just slightly rearward*

> *of the center of the wings of the shoes. In hind shoes, the nail holes should be driven in the anterior two-thirds of the wings of the shoes. A common rule is to drive the rear nails. The heels of the foot must have opportunity to expand as the foot touches the ground. If the nails are driven too far rearward, the heels are held too rigidly in place, there is no opportunity for the heels to expand, and the supporting structures are unduly abused because of maximum concussions. Nails should not be driven inside the white line of the foot, which is the junction between the hoof wall and the sole.*

Clenching the nail is the bending of the sharp point of the nail after it has been driven through the horny wall (Fitzwygram 1903:478).

Particular features of the nail (Figure 87a) are the head, neck shank, bevel and point. This bevel as it enters the horn forces the point of the nail in the direction of the flat side toward the outside edge of the shoe. The head of the nail is tapered on the same side as contains the bevel of the point. This tapered side of the head is roughened so that the horseshoer can determine the correct side of the nail by the sense of touch" (Armistead 1960:16).

Types of Horseshoes

A number of requirements must be taken into consideration when selecting the proper shoe for a given horse, such as weight, work, standing position, gait, hoof forms, and bearing-surface. A shoe should be slightly longer than the hoof, since the heel grows faster and carries the shoe forward, and since the toe and quarters wear faster. Horses that do heavy work should have long shoes (Lungwitz 1908:102) with three calks, whether either sharp or blunt, depending on weather conditions (Kays 1953:446). On the other hand, horses used in light work, as for coaches or riding, require shorter shoes (Lungwitz 1908: 102). Shoes should be wide enough to support the weight-bearing surface, or approximately three-quarters of an inch wide (Fitzwygram 1903:472).

> *The weight of the shoe should be so adjusted to the demands of the horse's work, the condition of the legs (whether used up with work or not), and the nature of the ground that the shoeing will last at least a month. Hard roads and a heavy, clumsy gait require strong, durable shoes, which, under some conditions are to be rendered still more durable by welding in steel. For moderate service upon soft roads we would use light shoes. Running horses require unusually thin and narrow shoes of steel (Lungwitz: 1908:102).*

The normal growth of the hoof renders it necessary to shoe the horse once a month (Fitzwygram 1903:473). A young horse needs to be shod more often than an older horse, since its horny hoof grows faster (Hayes 1960:565).

The shape of the shoe generally conforms to the circumference of the foot, and the bearing-surface of the hoof and the shoe should fit air-tight (Lungwitz 1908:103). Unduly heavy shoes overload the feet and may cause serious injury to the wall, since large-sized nails would have to be employed to secure the shoe (Hayes 1960:574).

Hayes (1960:574) considers the following to be important in determining the shape of the shoe: (1) the foot- or bearing-surface should be flat; (2) the shoe should be as thin as possible so the frog may bear weight; (3) the shoe should be of uniform thickness overall; (4) the bearing-surface of the shoe should conform to the shape of the wall and sole; (5) when clips are used, more iron should be used where there is additional wear; (6) thick-heeled shoes may be employed for unnaturally low heels; (7) heels of the shoe should be perfectly flat to prevent contracting of the heel of the hoof; (8) the shoe should project slightly beyond the heel of the foot for solid support; (9) the inner edge of the ground-surface should be beveled for a better foothold to lessen weight and avoid picking up stones; and (10) the ideal shoe should have a rolled-toe to conform to the well-worn unshod foot.

Since each set of hooves has certain individual characteristics, the shoe that fits a particular hoof will reflect to a degree the shape of the foot. Lungwitz (1908:101-102) describes the special peculiarities of each of the chief classes of shoes as follows:

> 1. Shoe for a Regular Hoof-Outer edge: moderately base-narrow (beveled under) all around. Distribution and direction of the nail holes: regular. Length: longer than the hoof by the thickness of the shoe.
>
> 2. Shoe for an Acute-Angled Hoof-Outer edge: strongly base-narrow around the toe, but gradually becoming perpendicular towards the ends of the branches. Punching: regular, except that the nail-holes at the toe must incline inward somewhat more than usual. Length: rather longer than the preceding shoe.
>
> 3. Shoe for an Upright (stumpy) Hoof-Outer edge: perpendicular at the toe; but if the hoof is very steep, then base-wide at the toe, i.e., beveled downward and outward. Punching: last nail should be placed just beyond the middle of the shoe. Direction of the holes: perpendicular. Length: short; at most, one-tenth of an inch longer than the hoof.
>
> In the case of "bear-hoof" the shoe should be long.
>
> 4. Shoe for a Base-Wide Hoof-Outer edge: the outer branch should be moderately base-narrow, i.e., beveled downward and inward, the inner branch perpendicular. Punching: upon the outer branch the holes should extend well back, while upon the inner branch they are to be crowded forward towards the toe. Length will depend upon the obliquity of the hoof as seen in profile.
>
> 5. Shoe for a Base-Narrow Hoof-Outer edge: the outer branch either perpendicular or base-wide; the inner branch strongly base-narrow. Punching: the nail-holes in the outer branch should be crowded towards the toe and under certain conditions, punched deeper than the wall is thick, on account of the greater width of this branch; in the inner branch the nail holes are to be distributed back to the quarter and punched light. Length will depend upon the obliquity of the hoof. The outer branch should be about one-eighth of an inch longer than the inner.

> 6. Shoe for a Wide Hoof--somewhat wider webbed (more covered) than usual. Outer edge: beveled under the foot all around (base-narrow). Punching: nail-holes carried back into the posterior half of the shoe. Length will depend upon the obliquity of the hoof.
>
> 7. Shoe for a Narrow Hoof-Outer edge: moderately beveled under the foot at the toe (base-narrow), elsewhere perpendicular. Distribution of the nail-holes: regular. Direction of the nail-holes: perpendicular and towards the quarters, inclining somewhat outward. The holes about the toe incline somewhat inward. Length will depend upon the obliquity of the hoof. Concaving unnecessary.

There are a number of special shoes to fit particular uses or to correct abnormal gaits and diseased feet. When it is desirable to leave the heel and bars uncovered, a tip is used which covers only the toe and anterior portion of the quarter (Fitzwygram 1903:480). The three-quarter shoe (Figure 85d) and half shoe (Figure 85e) serve to correct the gait by placing the weight in given areas of the foot (Lyon 1959) or to relieve pressure from corns caused by the bruising of the sole (Hayes 1960:198). The charlier shoe consists of a narrow rim of iron fitted into the wall by cutting a groove into it (Fitzwygram 1903:480).

There is variety of bar shoes, depending on the individual need of the bar. The bar can give pressure to the frog, or a heart-shaped bar may be desired for those horses required to do more than walk. The ordinary bar shoe does not give pressure to the frog and is usually used to prevent further splitting of a sandcrack (Hayes 1960:166). When the foot has corns on both sides of the sole, the bar appears like a tongue that is connected at the inner toe and extends the length of the shoe and slightly beyond without being attached at either of the opposite branches.

When support to the fetlock is required, a shoe with a vertical cross-bar should be used for best advantage (Hayes 1960:62). A high-heeled shoe is desirable for a sprain to the leg when the heel cannot touch the ground (Hayes 1960:43). The long-toed shoe is used to correct knuckling, which is the contraction of the lower leg and foot tendons, usually at the fetlock (Hayes 1960:226).

Rocking shoes have an extra piece of iron in the center of the shoe that gradually thins toward both ends. This type of shoe facilitates the horse in shifting body weight thus relieving sensitive areas of the foot (Fitzwygram 1903:482).

> *The shoeing of mules and asses (Figure 83e) is, as in the case of horses, a necessity if these animals are to be used for draught or saddle purposes on hard streets. The structure and characteristics of the hooves of these animals are quite similar to those of the horse, differing chiefly in the narrow and round at the toe, the sole is well-arched, and the side walls are rather steep. In the ass the narrowness of hoof is still more pronounced, the wall is relatively wide in the region of the quarters. The horn of both mule and ass is tough.*

> *The shoes differ from those of the horse in no other respect than that they should be lighter and narrower. Four nail-holes are sufficient for an ass's shoe, and five to six for a mule.*
>
> *On account of the hardness and toughness of the walls, we use nails that are short but strong in the shank; nails with weak shanks are apt to bend in driving (Lungwitz 1903:173).*
>
> *The shoeing of oxen (Figure 83f) is essentially different from that of horses, because the foot of the ox is cloven (split), the long pastern, short pastern, and hoof bone are double so that instead of one hoof or claw, there are two upon each foot, distinguished as outer and inner. Each claw consists of wall, sole, and bulbs; the frog is absent. The wall is considerably thinner than that of the horse's hoof, the sole is thin, and the bulbs are low. For these reasons the shoe designed for a claw must be thin, but wide.*
>
> *The holes must be punched fine and the nails be quite short and strong. On each shoe a long tongue should be made on the inner edge near the toe, and so directed that it can be turned upward and outward to embrace the toe of the claw. A small clip raised on the outer toe of each shoe will increase its stability. (Lungwitz 1903:173-174).*

Wears on Horseshoes

Lungwitz (1908:75-76) gives an excellent summary of the wear on horseshoes as follows:

> *The wear of the shoe is caused much less by the weight of the animal's body than by the rubbing which takes place between the shoe and the earth whenever the foot is placed to the ground and lifted.*
>
> *The wear of the shoe which occurs when the foot is placed on the ground is terms 'grounding wear,' and that which occurs while the foot is being lifted from the ground is terms 'swinging-off wear.' When a horse travels normally, both kinds of wear are nearly alike, but are very distinct when the paces are abnormal, especially when there is faulty direction of the limbs. While in the majority of horses whose limbs have been stiffened by age and overwork both kinds of wear are most marked at the toe of the shoe, we see relatively fewer cases of 'grounding wear' at the toe of the shoe. It is worthy of notice that length of stride has much to do with the wear. We observe that with shortening of the stride both kinds of wear occur at the toe of the shoe, and this is rapidly worn away, as is the case with horses which are fretful and prance under the rider, draw heavy loads, or from any other cause, as disease or infirmity, are obliged to shorten their steps. With increase of length of stride the wear of the shoe becomes more uniform.*
>
> *Also the position and form of the shoe have a marked influence upon its wear; at the place where the shoe is too far under the hoof, either as a result of shifting or of*

> *having been nailed on crooked, or where the outer branch has not the necessary width, or does not form a sufficiently large curve, the wear will be increased (Lungwitz 1903:75-76).*

The wear on a normal-angled foot (Figure 88a) should be uniform but when the foot is broken forward (Figure 88b) there is considerable grounding wear at the ends of the branches and swinging-off wear at the toes; this wear is similar to that of the broken-backward foot (Figure 88c) (Armistead 1960:10).

In the regular standing position the wear should be uniform, possibly with slightly more wear at the toe, since the foot is carried in a straight-line direction in relation to the median of the body. The wear on the base-wide stance (toes pointing out) will be on the inner toe of the fore-shoes, since the foot is carried slightly inward and then outward to the ground. On the other hand, the wear on a base-narrow stance (toes pointing in) will be on the outer toes, because the feet are carried outward (Lungwitz 1908:67-68).

Horseshoes from Simpson Springs

A total of eleven horseshoes and one muleshoe were recovered from the site (Figure 89). Most were badly oxidized or broken, making it difficult to identify some specific features of the shoe. All of the shoes were fullered and were attached to the animal's foot by four nails.

Half of the shoes were forge-calked, while two had toe clips, two were seated, and two had widened webs (Table 7). Only one shoe had a trailer. On those shoes where wear could be determined, most had heavy wear and one moderate wear. Toe wear varied from inner, to center, to outer wear. Of the shoes when sides could be identified, four were right front shoes, two were left front shoes, one was a left rear shoe, and one was a right rear shoe.

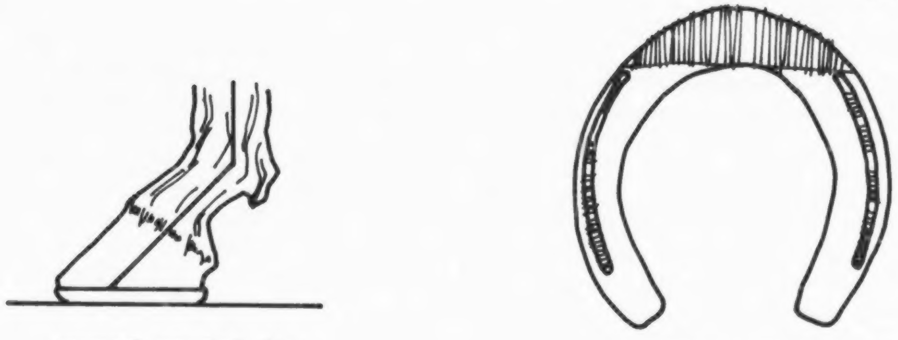
It would seem that defects in the horse's gait were corrected by shoes, and that worn or lost shoes were replaced at the station.

Other Horse Trappings

Single Tree Clip or Hook: This is a large iron hook with a flat, broadened attachment section and a round overlapping eye (Figure 90a). This hook appears to be hand forged, and similar types are found in the Sears Catalogue of 1902 (p. 470). Length: 6.3 in. Width: 2.5 in. Provenience: Str. 4 (Figure 90a).

Metal Rings: There are many types and sizes of rings used on saddles, breeches, collars, and leather straps. These have been illustrated in the Sears Catalogue (1902). Diameter: 2.4 in. Thickness: .2 in. Provenience: Str. 2 (Figure 91a).

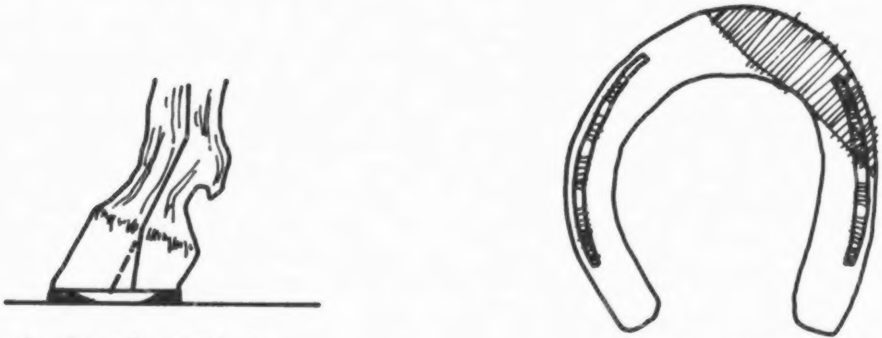
Harness Snap: There are also many types of snaps used with horse trappings. Some of these are illustrated in the Sears Catalogue (1902). Length: 2 in. Width: 1.25 in. Provenience: Str. 1 (Figure 91b).



normal angled foot

regular wear

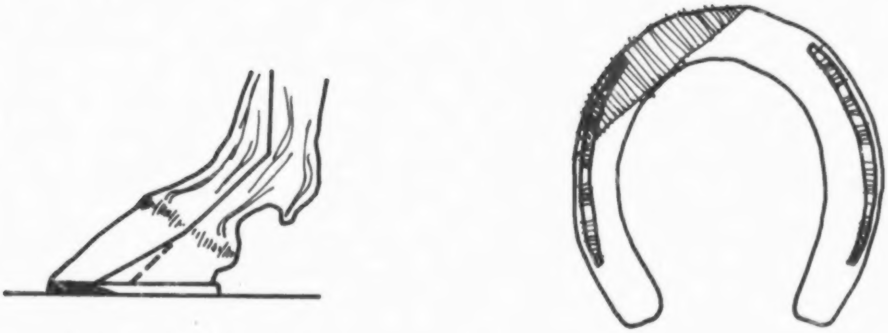
a



broken-forward foot

base-wide wear

b



broken backward foot

base-narrow wear

c

Figure 88.
Wear on horseshoes.

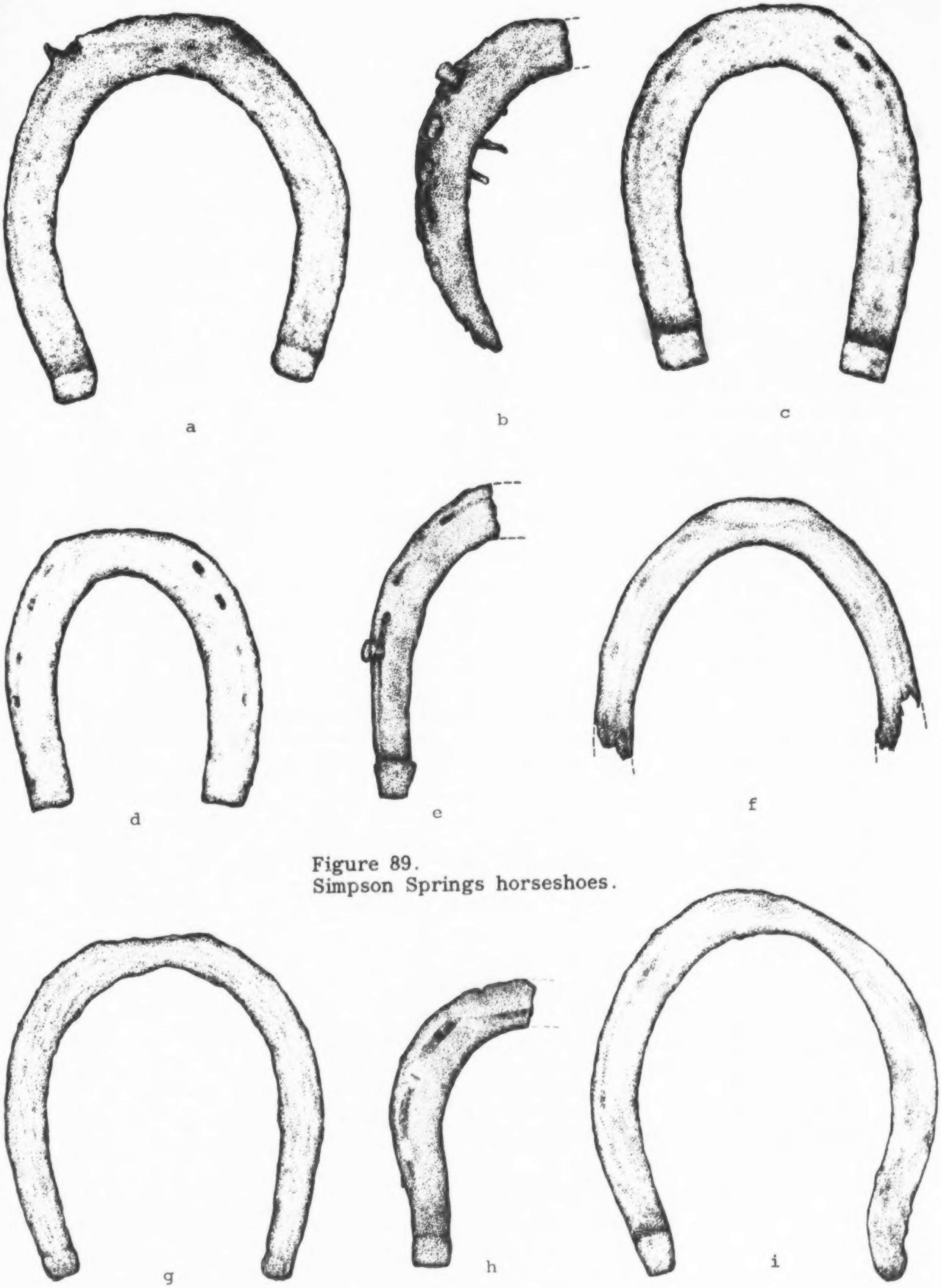


Figure 89.
Simpson Springs horseshoes.

TABLE 7

Characteristics of Simpson Springs Horseshoes

		Type		Dimen-sion		Calks				Web					Wear					Toe Clip						Oxid-ized			FRONT		REAR	
PROVENIENCE AND DESCRIPTION NUMBER	Figure 89	Horse	Mule	Length	Width	Toe	Heel	Forged	Toe Clip	Seated	Fullered	Feathered	Widened	Trailer	None	Light	Moderate	Heavy	Unknown	Uniform	Inner	Center	Outer	Striking	Nails Per Side	Heavy	Moderate	Light	Right	Left	Right	Left
STRUCTURE 1																																
1.	a	x		6.2	5.5		x	x			x								x						4	x			x			
2.	b	x		5.2							x							x				x			4							
3.	c	x		5.7	4.7		x	x		x	x		x					x			x				4		x				x	
4.	d	x		4.5	4.0					x	x		x					x					x		4				x			
STRUCTURE 2																																
1.	e	x		5.0			x	x			x								x						4	x						
2.	h		x	4.2			x	x			x							x				x			4			x				
STRUCTURE 3																																
1.		x		4.8	4.5						x								x						4	x			x			
2.		x									x															x						
STRUCTURE 4																																
1.	f	x			4.8				x		x								x						4	x				x		
2.	g	x		5.5	4.9						x							x			x				4	x				x		
3.	i	x		6.4	5.2		x	x			x			x				x					x		4		x		x			
TRENCHES																																
1.		x		6.0	5.6		x	x	x		x						x					x			4		x					x
		11	1				6	6	2	2	12		2	1			1	6	4		2	3	2			6	4	1	4	2	1	1

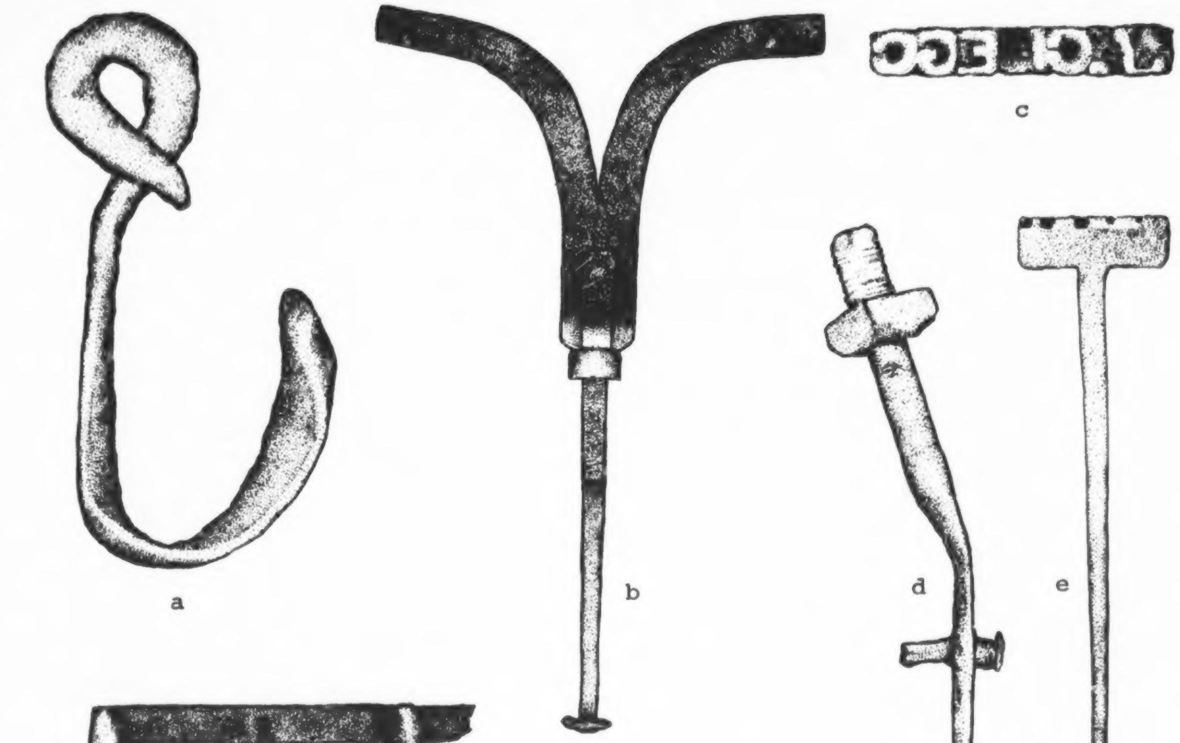


Figure 90.
Metal artifacts.

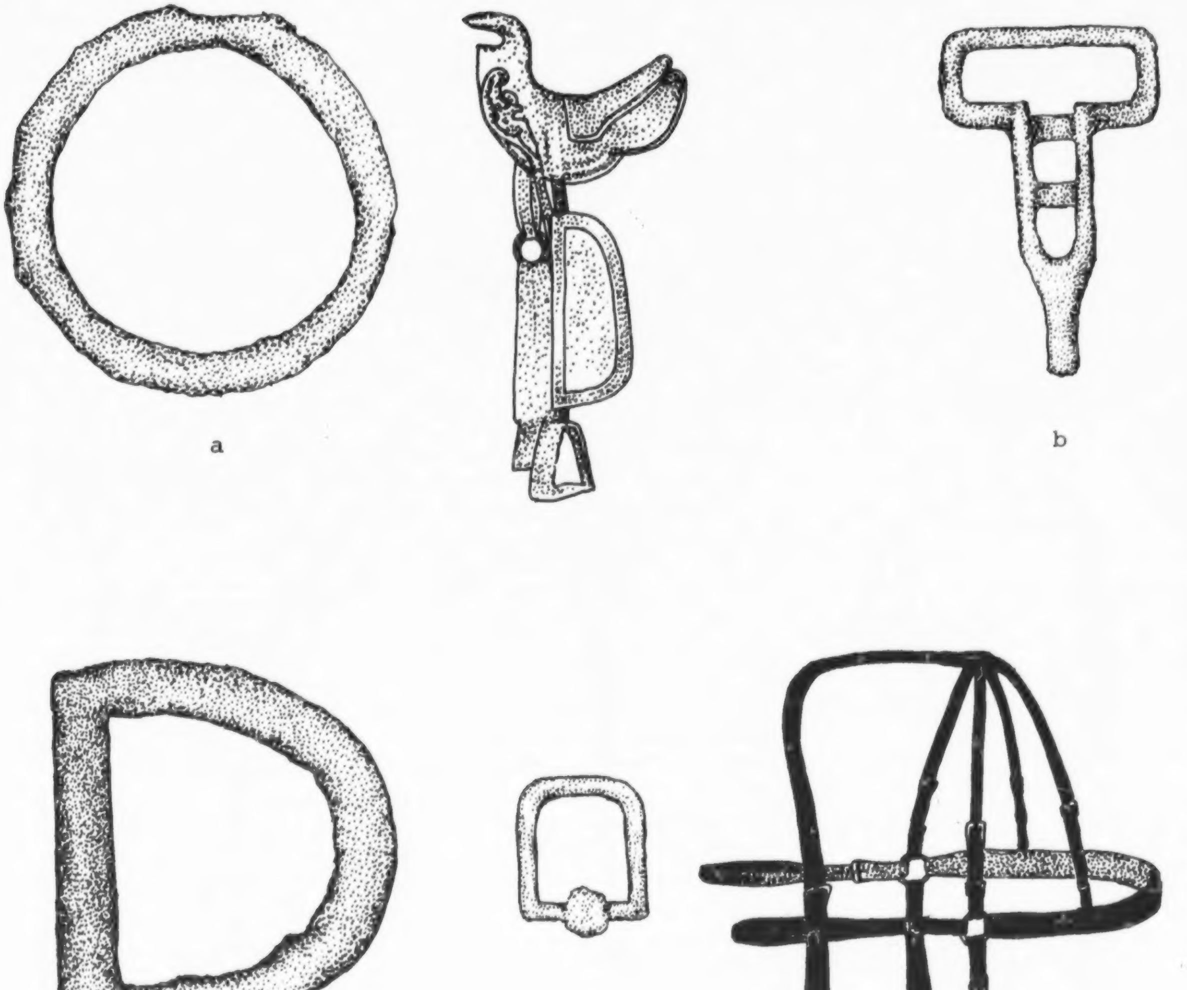


Figure 91.
Horse trappings.

Curry Comb Handle: The Sears Catalogue (1902:413) illustrates this exact curry comb at a cost of 15 cents. Length: 8.5 in. Width: 3.25 in Provenience: Str. 1 (Figure 90b).

Branding Iron: On the head of this branding iron is the name of "J. Clegg." Length: 26 in. Letters: .5 in. Provenience: Str. 4 (Figure 90c-d).

There are other objects, probably horse trappings also:

D Ring: This type of ring was used on leather harnesses or on saddles, as illustrated in the Sears Catalogue (1902). Length: 2.25 in. Width: 1.9 in. Provenience: Str. 4 (figure 91c).

Breeching Buckles: These buckles are used on horse breechings to secure or adjust the leather straps. Length: .75 in. Width: .9 in. Provenience: Str. 1 (Figure 91d).

Harness Buckles: These buckles were used on the wider leather straps of the harnesses. Length: 2.4 in. Width: 1.75 in. Provenience: Str. 4 (Figure 91e-f).

Nails and Staples

Fontana et al. (1962:44-66) provides an excellent history of nail manufacture and methods of dating. Only the highlights of nail identification and dating techniques are presented herein. He (p. 52) distinguishes the difference between square cut nails and square wrought iron nails by the following criteria:

> 1. *Wrought nails taper on all four sides of the shank toward the point rather than on two opposite sides as in the case of square cut nails.*
>
> 2. *Wrought nails vary in thickness throughout the length of the shank because of their having been hand forged; square cut nails exhibit uniform thickness because of their having been cut from a plate of uniform thickness.*
>
> 3. *Striations, minute parallel shear marks resulting from the smear of the cutting blade used to make square cut nails, are absent on shanks of wrought.*

For the purpose dating nails Fontana et al. (1962:54-55) presents the following survey:

> *Before Christ--A.D. 1800: Nails were handmade, wrought nails, universally characterized by uneven rectangular shanks that taper on all four sides to a point. For certain purposes wrought nails continued in use until as late as 1850, and in isolated instances may have been made in the United States when square cut or wire nails were not available.*

1790-1810: This period is characterized by machine-cut nails, the nail plate being reversed under alternate blows of the cutter to give the cross section shown. A few stamp-headed nails occur, but most are headed by a single hand-driven hammer blow. Angle-headed or L-headed nails made from headless nails also appear and continue in use until after the 1850's for use in floors and clapboards.

1810-1825: Machines are invented to make cut nails that obviate the necessity of having to turn the nail plate. The result is the cross section in the shank shown. Until 1825 such nails continued largely to be headed simply by being struck with a hammer.

1825-1830: Cutting of nails continues as immediately above, but water-powered machines are developed that head them automatically. The heads, however, are rather thin and lopsided.

circa 1830-circa 1855: Wire nails are invented in France (hence "French nails") that are ground to a point and headed by hand. The first such nails are made in the United States by William Hassall (or Hersel) of New York City. They are rare in the United States during this period.

1830-circa 1890: Cut nails are produced in machines that cut and head them uniformly. Heads are less thin, more uniform, and comparatively square. They are extra heavy on large nails. Cross section of shanks on virtually all nails is as shown. Cut nails in the United States during this period outnumber all other kinds with respect to both numbers and varieties.

circa 1855-present: Machines are invented in France to make complete wire nails automatically. A few are exported to the United States, soon to be replaced by machines of American manufacture. It is about 1890, however, before wire nails outnumber cut nails. Wire nails today are the common variety in this country.

circa 1870-present: Cut nails are annealed to prevent their rupturing when clinched.

circa 1890-present: Cut nails continue to be manufactured for special purposes, such as securing wood to cement, concrete, or plaster. Until about 1950, when they were replaced by cement-coated nails for the purpose, but nails were so commonly found in sub-flooring for hardwood floors. It was also probably early in this period that large cut nails were pre-tapered in rolling mills, the nails then being cut with parallel rather than diagonally opposing strokes of the knife.

In addition, Arnold (1947:101) provides the following method for dating nails:

Nails:	
Wrought-iron	*to c. 1800*
Cut nails, wrought heads, 2 cutter strokes	*1800 to c. 1810*
Cut nails, wrought heads, 1 cutter stroke	*1810 to c. 1825*
Cut nails, stamped heads	*after c. 1825*
Cut nails, L-headed and headless	*after c. 1800*

Sixty-seven square nails were recovered in the excavation of the four structures at Simpson Springs (Table 8). Most of these (51) came from Structure 1, suggesting that this building was the oldest, since nails from other structures were almost entirely wire nails.

In addition to the square nails there were ten horseshoe nails, three date nails, 493 wire (round) nails and thirteen staples recovered from the four structures. Horseshoe nails are discussed in the section on horseshoes.

Date Nails: The primary use of the date nail is to determine the year in which a railroad tie was installed along a line. It was also used for identifying wood treatments (for determining which preserved the wood longer), determining wood types, and other purposes. In fact, date nails were also used by electric companies, telephone companies and several other companies utilizing wood products (Lewis 1975:iv).

Lewis (1975:iv) provides a history of date nails as follows:

> *Increasing the length of the serviceable life of a railroad cross tie became one of the early concerns of its users. Preserving wood by treating it with oils and chemicals developed from a crude and modest beginning into a sophisticated and highly advanced industry. Experimentation to determine which kind of treatment was the best became widespread towards the end of the nineteenth century. Generally the French and Germans were a few years ahead of the Americans in their development of treatments and techniques. The European experimenters first realized the need to identify and mark the wooden ties so that some satisfactory conclusion and record could be made on the life of the tie. The earliest use of record of nails with marked heads as referred to in the 1920s by G. J. Ray, a railway chief engineer, who told of observing galvanized date nails in Belgium dated 1892 and 1893.*
>
> *Although the Europeans may have used dated and reference nails through the 1890s, their use in the United States probably did not develop until 1900 when Octavius Chanute, a railway consulting engineer from Chicago, returned from travels in Europe where he inspected railway constructions. He returned to the States and recommended, among other things,*

SUMMARY OF NAILS AND STAPLES

SUMMARY OF SQUARE NAILS		STRUCTURE				TRENCHES	
PENNYWEIGHT	LENGTH in in.	1	2	3	4		TOTALS
BADLY CORRODED (UNKNOWN)		36	6		3		45
2	1						
3	1¼						
4	1½	1					1
5	1 3/4						
6	2						
7	2¼						
8	2½	2			1	4	7
9	2 3/4	2					2
10	3	2					2
12	3¼						
16	3½	2	1				3
20	4	2					2
30	4½	1					1
40	5	3					3
50	5½	1					1
60	6						
TOTAL OF SQ. NAILS		51	8		4	4	67
HORSESHOE NAILS		10					10
DATE NAILS				3			3
WIRE NAILS		79		229	173	12	493
STAPLES		5	1	7			13
TOTALS		145	9	239	177	16	586

Table 8

> *to the American Railway Engineers and Maintenance-of-Way Association (and probably to private railroad clients) that they begin using dated nails, tacks or tags. The need was already apparent since various branding techniques had been used for several years and the nail idea found ready acceptance. The association began joint experiments with several of its member railroads using various treatments and nails in 1900 and 1901 and several railroads began their own dating systems about this time.*

Differences may be seen in the manufacturing techniques employed by different companies. Some date nails are made from copper, aluminum, brass or cast iron. The more common types are made of steel and coated with galvanized zinc. The nail shank can be round or square, with differing marks near the head. The shank is usually one-fourth inch wide and two-and-one-half inches long. The head may have numbers, letters or symbols which are raised in relief or indented (Lewis 1975:iv).

The three date nails found at Simpson Springs came from Structure 3. These nails have a raise "23" on the upper surface of the head, which means the ties in which they were found were laid along the railroad in 1923. The shanks have opposing slash marks near the head (Figure 92d).

Many companies used date nails like those found at Simpson Springs; however, Lewis (1975:169) illustrated types used by the Union Pacific which are very similar to the types excavated during this project.

Wire Nails: Although the wire nail was invented in France early in the nineteenth century it was not until 1890-1895 that the wire nail industry almost replaced the cut nail industry (Fontana et al. 1962:47-48). The 493 wire nails discovered were not subdivided into pennyweight. They were so badly corroded and fragmented that their size was difficult to determine accurately. They will be used for dating as a group. Most of the wire nails fell within the eight penny to sixteen penny range.

Staples: This group of artifacts is made up of U- or V-shaped, double-headed nails used for securing barbed wire or some other form of wire to wood, usually a post (Figure 92e-g).

Tin Cans

Although the can has an older history, it was first patented in England in 1810 by Augustus de Heine and Peter Durand and produced in quantity beginning in 1811 by Bryan Donkin (Fontana et al. 1962:68). In describing this can, Fontana et al. (1962:68) states:

> *The can, at this early period on both sides of the Atlantic, was laboriously cut from tinplated sheet iron by hand or footpowered scissors; the body formed around a cylinder and*

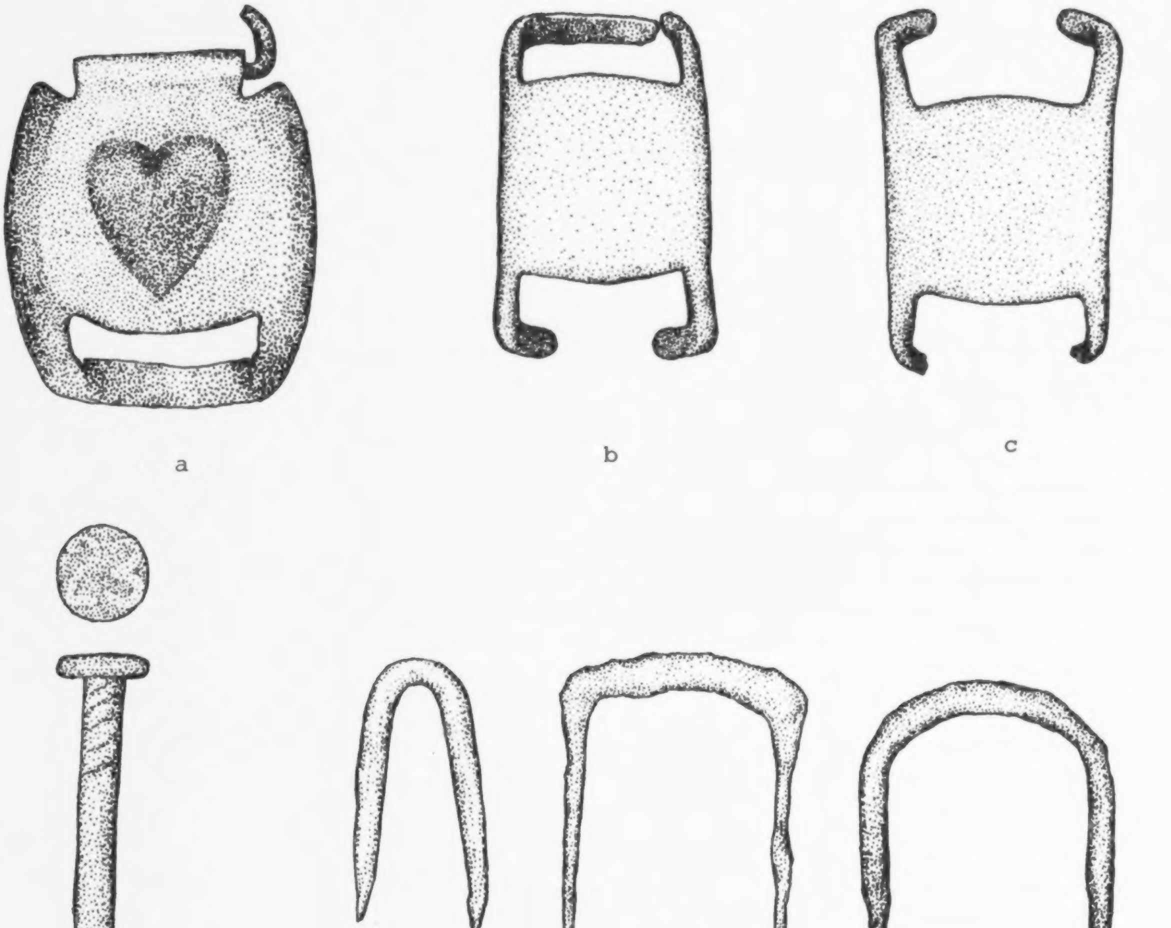

a
b
c
d
e
f
g
h
i
j
k

Figure 92.
Buckles, staples and can tops.

> *the seam soldered. Separate pieces for top and bottom were cut and soldered. Often the ridge of solder might stand out in relief as much as one-eighth inch. A hole was left in the top through which food was forced. A smaller cap was finally soldered in place after filling. Carbon specks were the rule when syrups were overheated by crude hand soldering "coppers." A pin-hole in the cap allowed gases to vent. One last drop of solder completed the job. This type of can became known to the trade as the "hole-in-top" or "hole and cap." This method of closure, with small variations, persisted until the 1900s.*

The modern open-top can had its beginnings in 1833, but it was not until 1897 that Charles Arns and Julius Brenzinger, New York City, began to produce cans with crimped tops and bottoms with double seams. This can had its drawbacks to begin with, but by 1902 it was replacing the hole-in-top can being manufactured by A. W. Cobb. The Sanitary Can Company, owned by Cobb, was absorbed by the American Can Company in 1908. By 1922 this can had general acceptance in the industry (Fontana et al. 1962:72-73).

The first consumer product can was developed by a dentist, Dr. J. W. Lyon, New York City. He sold tooth powder in the 1860s to other dentists but soon developed a green can for home use with a cylindrical dome and holes for dispensing the powder (Can Manufacturers Institute Inc. nd:23).

Some important developments in the can industry are as follows (Can Manufacturers Institute Inc. nd:22-39):

1813--Nicolas Appart initially canned meat and first products
1818--British Navy was heavily supplied with canned meats
c.1820--Canning of fruits and vegetables in the United States by Thomas Kensett, New York City, and William Underwood, Boston
1850s--Kerosene patented
1856--Gail Bordens built the first canned milk factory
1861--Salt added to canning water to increase production
1865--Kerosene canned
1872--Large-scale meat canning began in Chicago
1874--Pressure cooker invented to control temperatures while cooking sealed cans
1875--Shrimp canned in New Orleans
1875--Sardines packed in Maine
1878--Salmon cannery opened in Alaska
1892--First tobacco can
1898--Vacuum packing began
1900--Canned frankfurters
1906--Modern paint can came into use
1909--Tuna canning began in California
1910--Flat-sided, hinge-lidded tobacco can came into use
1917--Ernst Moeller, Bayer Company, developed the idea of a pocket-size aspirin box
1917--Key-opening collar-can for coffee introduced
1921--Canned citrus juice first shipped from Florida

1922--First canned dog food developed by P. H. Chopped
1926--Canned ham was introduced
c.1930--Canning of beer began
1933--Quart can of motor oil used
1939--"Blair Process" first used to retain true vegetable color
1940s--During World War II the aerosol can was used to dispense insecticide against malarial mosquitoes in the South Pacific
1940s--After the war, shaving cream and many other uses for aerosol cans developed
1953--Canned soft drinks became popular

The two major producers of metal cans in the United States in the 1950s were American Can Company and Continental Can Company. They manufactured practically every type of can, and these two firms sold over 70 percent of the output within this country (McKie 1959:84).

The American Can Company, the largest manufacturer of metal containers, was organized in 1901, at which time it maintained a strong monopoly, having sales of over 90 percent of the industry. The industry sales of this company fell to about one-half in 1913. In the next three decades it fluctuated between 40 and 50 percent (McKie 1959:86).

Continental Can Company was founded in 1904, and by 1919 it was the second largest firm in the United States. In the next twenty-five years it gradually grew to a position of prominence. One of its largest accounts was that of that of Campbell Soup Company, the world's largest user of tin cans (McKie 1959:89).

Other manufacturers of tin cans include National Can Corporation (began in the 1930s; in 1955 acquired the stock of Pacific Can Company, founded in 1927; and in 1952 merged with Cans, Inc.); Crown Can Company (founded in 1927; became the largest producer of metal crowns and caps for bottles in 1936; and this same year purchased Acme Can Company); Heekin Can Company (founded in 1901); Fein Tin Can Company, Inc. (founded about 1930); Phelps Can Company; Western Can Company (began before 1918); J. L. Clark Manufacturing Company; and Owens-Illinois Glass Company (began producing cans in 1936). Companies that produced their own cans are the Campbell Soup Company (began manufacturing its own cans in 1937); United Can and Glass (affiliated with Hunts Foods); H. J. Heinz Company (has manufactured part of its own requirements since 1914); and Phillips Packing Company (operated from 1915 to 1957, when it was acquired by Consolidated Foods Corporation). Several other small firms make small quantities of cans. Other companies that make their own cans in small amounts are Carnation Company; Pet Milk; Borden Products Company; Nestle Company; Sherwin-Williams; Federal Tin Company (owned by Lorillard); R. J. Reynolds Tobacco Company; Texas Company; Standard Oil Company of Ohio; and several others (McKie 1959:92-105).

The can industry generally recognizes two types of manufactured cans: (1) Packer's cans, sometimes called "sanitary cans," the familiar fruit and vegetable cans; and (2) General-line cans, which include other general types.

The tin cans from Simpson Springs are badly oxidized and very fragmented, except for some relatively modern cans, which include a beer can, a snuff can, a Figsen Laxative can (pat. 1906), and a Libby's Meat Loaf can. All of these cans were found at or near the surface in Structure 1.

From the fragmented pieces recovered from Structure 4, where the soil was very wet, enough of the lids remained that it could be determined that most were of the hole-in-top type (Figure 91h-k). This type of can lost its popularity around the turn of the twentieth century.

Cutlery

America depended almost entirely on Sheffield, England for cutlery until the 1840s (Van Hoesen Taber 1955:1). In the 1830s, David Ropes manufactured table cutlery at Saccarappa, Maine, then later moved to Meriden, Connecticut. In 1855 it became the Meriden Cutlery Company. In 1866, it was purchased by Landers, Frary and Clark of New Britain, Connecticut and became one of the largest cutlery manufacturers (Lifshey 1973:308).

Other early manufacturers were the John Russell Company, Greenfield, Massachusetts, started in 1834; Empire Knife Company; Miller Brothers; Southington Cutlery Company; and William Rogers Manufacturing Company, all of Connecticut. The Ontario Knife Company, Naples, New York was founded in 1889 and incorporated in 1902 (Lifshey 1973:309-310).

Several sections of cutlery were found in Structures 1, 2, and 4 at Simpson Springs. In Structure 1 three handles to either knives or forks were excavated. One handle was made of wood, while the other two had the outer covering missing. The handles were secured by three rivets.

In Structure 4, six handles were unearthed, all approximately 8 centimeters long. Three are wood handle sections; one a fork handle; and two, knife handles (Figure 93b-c). In addition, one badly corroded three-tined fork with a wooden handle was found (Figure 93a); one all-metal knife, 24 centimeters long, was recovered (Figure 93d); and one all-metal four-tined fork measuring 19 centimeters long was excavated (Figure 93e). None of these cutlery items had hallmarks or other distinguishing features. Examples of all of these types can be found in the 1897 Sears and Roebuck Catalogue (Israel 1976).

Although the knife has been used as one of the earliest stone tools, it was not until the Bronze Age that it was made of metal, and not until the fourteenth century that it was used on the table for eating. Spoons are also very ancient, having been found of clay, bone, and shell, and later of metal, even gold and silver. It was during the Renaissance in Italy that the fork was used for upper-class dining. Two-tined forks were popular for two hundred years, but it was not until the middle of the eighteenth century that four-tined forks

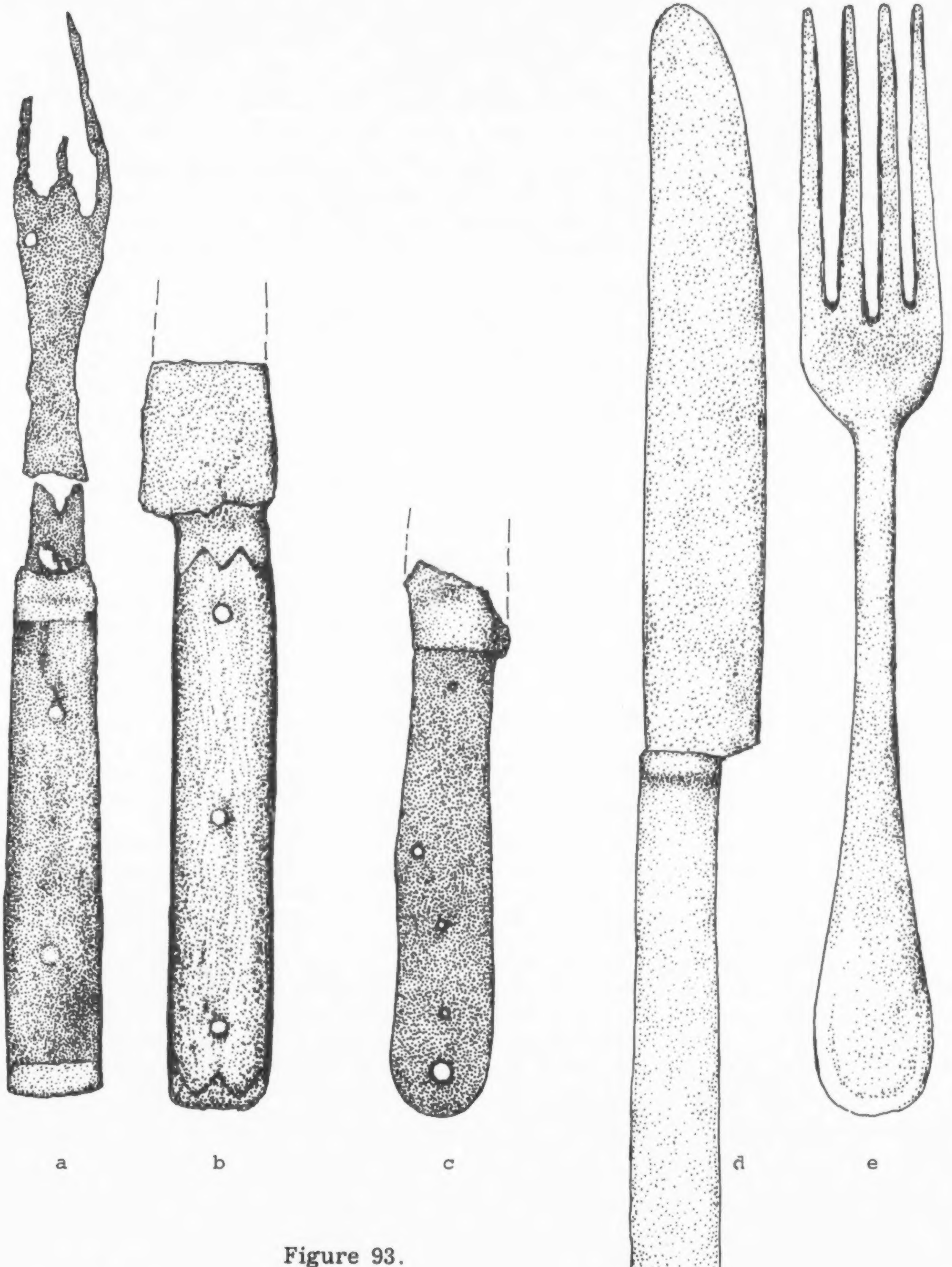


Figure 93.
Cutlery.

became standard. The knife, fork and spoon came together as part of well-mannered dining in the latter part of the seventeeth century (Lifshey 1973:307).

There were many attempts to develop a machine for grinding knives in the late nineteenth century. The machine that had the greatest effect on the industry was the Hemming grinder, produced in 1903. Two-thirds of all grinding was done by machine by the early 1920s. New steel alloys developed during World War I made cutlery more durable and attractive (Van Hoesen Taber 1955:46-47).

Rust-resistant steel was attempted as early as 1820 in France by Berthier (Lifshey 1973:312); and rustless iron, of no value to cutlery, was made in 1880. Finally in 1916 a patent for stainless steel, an alloy of carbon steel and chromium, was granted to Harry Brearly. Gradual developments led to the almost universal use of stainless steel in some lines during the 1930s. During this period half of all cutlery was stainless (Van Hoesen Taber 1955:46-49). Oneida, Limited and International Silver Company are the two largest producers of stainless steel flatware, established in 1848 in Oneida, New York (Lifshey 1973:313).

Miscellaneous Metal Objects

Within this category are numerous metal objects which do not represent any quantity of related objects. Most of these are briefly described, since almost all are badly oxidized and very delicate to handle.

Nuts and Bolts

Machine Bolts: Ten bolts were recoverd from the following structures (Comparee with Sears 1925:878) (figure 94c).

Structure 1.

1. *Round flat head bolt, 2.375 inches long.*
2. *Anchor bolt with a chisel-like end; on the other end is a nut and washer; badly corroded; 5.125 inches long and .75 inches in diameter.*

Structure 2.

None.

Structure 3.

None.

Structure 4.

1. *Badly corroded bolt with a square nut; 4.75 inches long.*
2. *Badly corroded bolt; 2.5 inches long.*
3. *Badly corroded bolt with a round head; 2.5 inches long.*
4. *Badly corroded bolt; 1.5 inches long.*

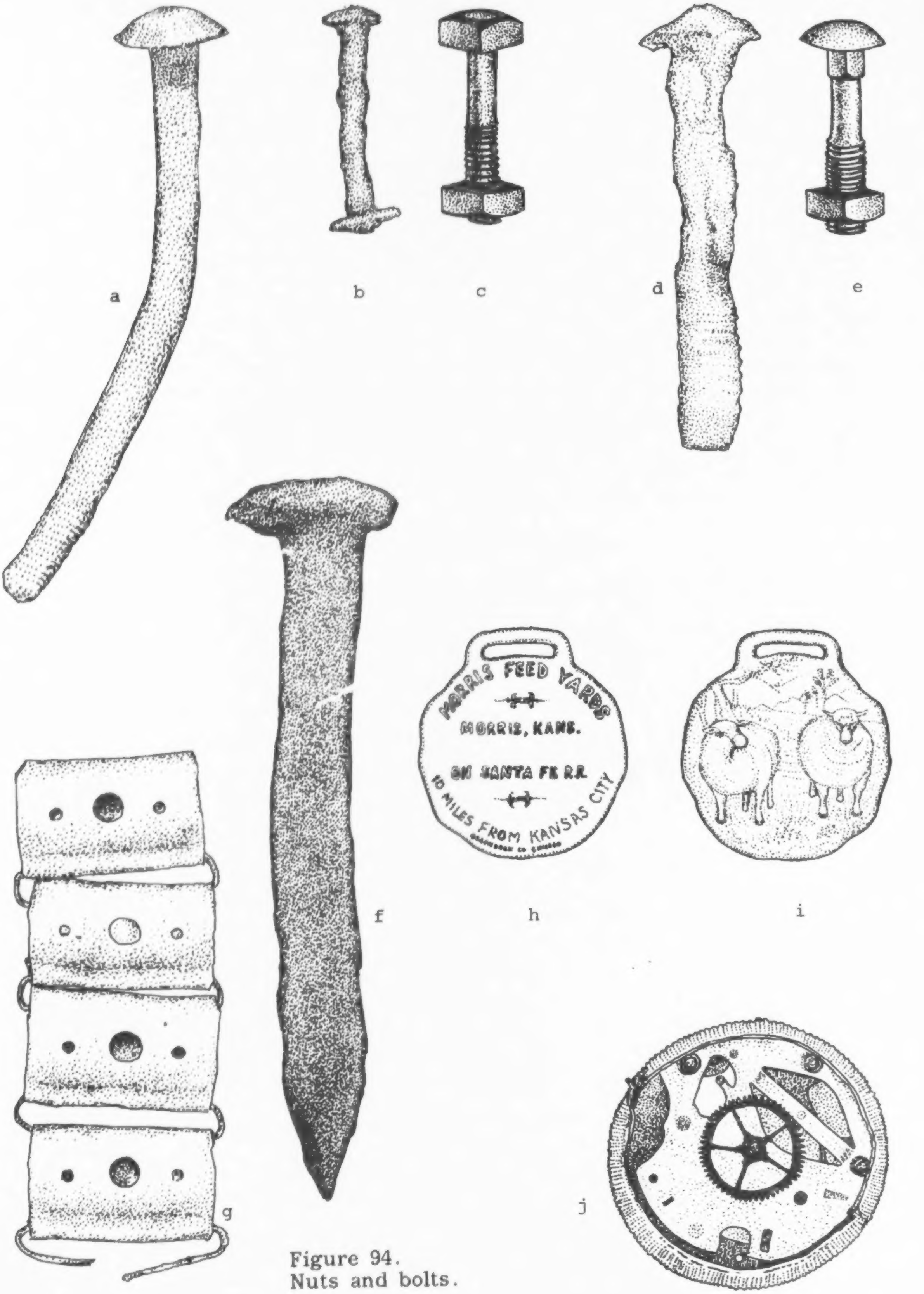

a
b
c
d
e
MORRIS FEED YARDS
MORRIS, KANS.
ON SANTA FE R.R.
10 MILES FROM KANSAS CITY
f
h
i
g
j

Figure 94.
Nuts and bolts.

5. *Badly corroded bolt; 1.75 inches long.*
6. *Badly corroded bolt with nut; 2.75 inches long.*
7. *Badly corroded, broken bolts.*
8. *Badly corroded, broken bolts.*

Carriage Bolts: These bolts were used to secure sections of wagons or carriages. They have round heads with partially square shanks for securing (Compare Sears 1925:878) (Figure 94e).

Structure 1.

1. *Round headed bolts; 3.5 inches long.*
2. *Round headed bolt; 4.75 inches long (Figure 93d).*

Hexagonal Nuts: (Compare Sears 1925:878).

Structure 1.

1. *Hexagonal nut; .625 inches in diameter.*

Structure 3.

1. *Hexagonal nut; 2.25 inches in diameter; 1.25 inches thick; and 1 inch shaft.*

Square nuts: (Compare Sears 1925:878).

Structure 1.

1. *Square nut; 1 inch square; ½ inch shaft opening; .375 inches thick.*

Structure 3.

1. *Large square nut; 2 inches square; .625 inch shaft opening; .625 inches thick.*

Wagon Parts

The only iron artifact belonging to this category is a wagon box strap (Figure 90e). It measures 13 inches long and .75 inches wide. Wagon box straps varied according to length, weight and diameter of screws. Cost ranged from 22 cents to 37 cents each (Sears 1925:470).

Railroad Spikes

Spikes were used to secure railroad tracks to ties. Two of these spikes came from Structure 3 when the floor was made of ties. The other was from Structure 4. They measure 5.375 inches long by .635 inches on each square side of the shank (Figure 94f).

Buckles

Several styles of buckles were found in the structures at Simpson Springs. Harness buckles are described in the section on horse trappings (See also Figure 91). Buckles illustrated in Figure 92a-c are loop buckle shields, used to dress up ordinary harness buckles. They are further illustrated in Sears (1925:909).

Also included in this section is a metal belt put together in sections. Six links are made of copper (Figure 94g).

Sheep Shears

Sears (1925:435) illustrates this exact type from Structure 4. It measures about 12.5 inches long with a blade 1.75 inches wide. The total length of the blade is six inches (Figure 95c). A pair of these shears cost 73 cents.

Handled Gear Wheel

Many form tools are illustrated with similar wheels, such as forges, hand-turned sheep clippers, feed cutters, hullers, and sawing machines (Sears 1925:518-519). The one found in Structure 4 measures 12 inches wide (Figure 95a).

Malleable Stand

This stand from Structure 4 was used to hold shoe lasts to make shoes or boots. Such stands came with four different last sizes, weighing altogether about 19 pounds, costing 80 cents (Sears 1925:728) Figure 96).

Watch Bob

This watch bob from Structure 4 has two sheep grazing in the front; on the back it states "Morris Feed Yards, Morris, Kans, on Santa Fe R.R., 10 miles from Kansas City." It was made by "Greendock Co., Chicago." It measured 1.5 inches across (Figure 94h-i).

Pocket Watch

This pocket watch from Structure 4 measured 2.125 inches across. Only the frame was present, with a few of the movements. There are no datable features on the watch. Several which may have been similar are illustrated in Sears (1925:203) (Figure 94j).

Purse Frame

This frame from Structure 1 probably belonged to a coin purse, as illustrated in Sears, Roebuck and Co. Catalogue (1925:482). It was undoubtedly attached to a cloth or leather pouch. This frame is 2.75 inches long and .25 inches wide. It snaps closed with a small ball on top. The copper frame was nickel plated (Figure 97a).

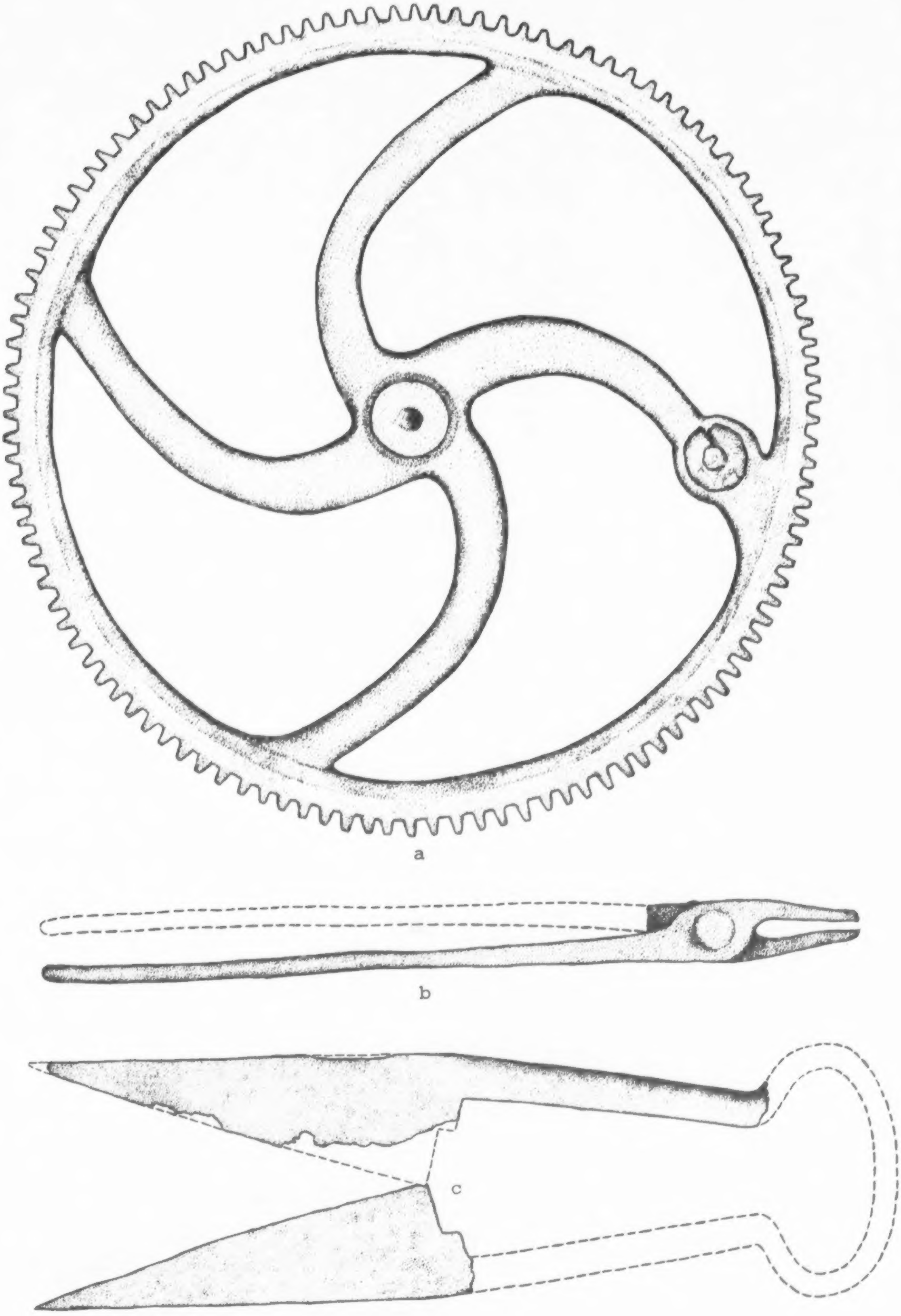


Figure 95.
Miscellaneous metal artifacts.

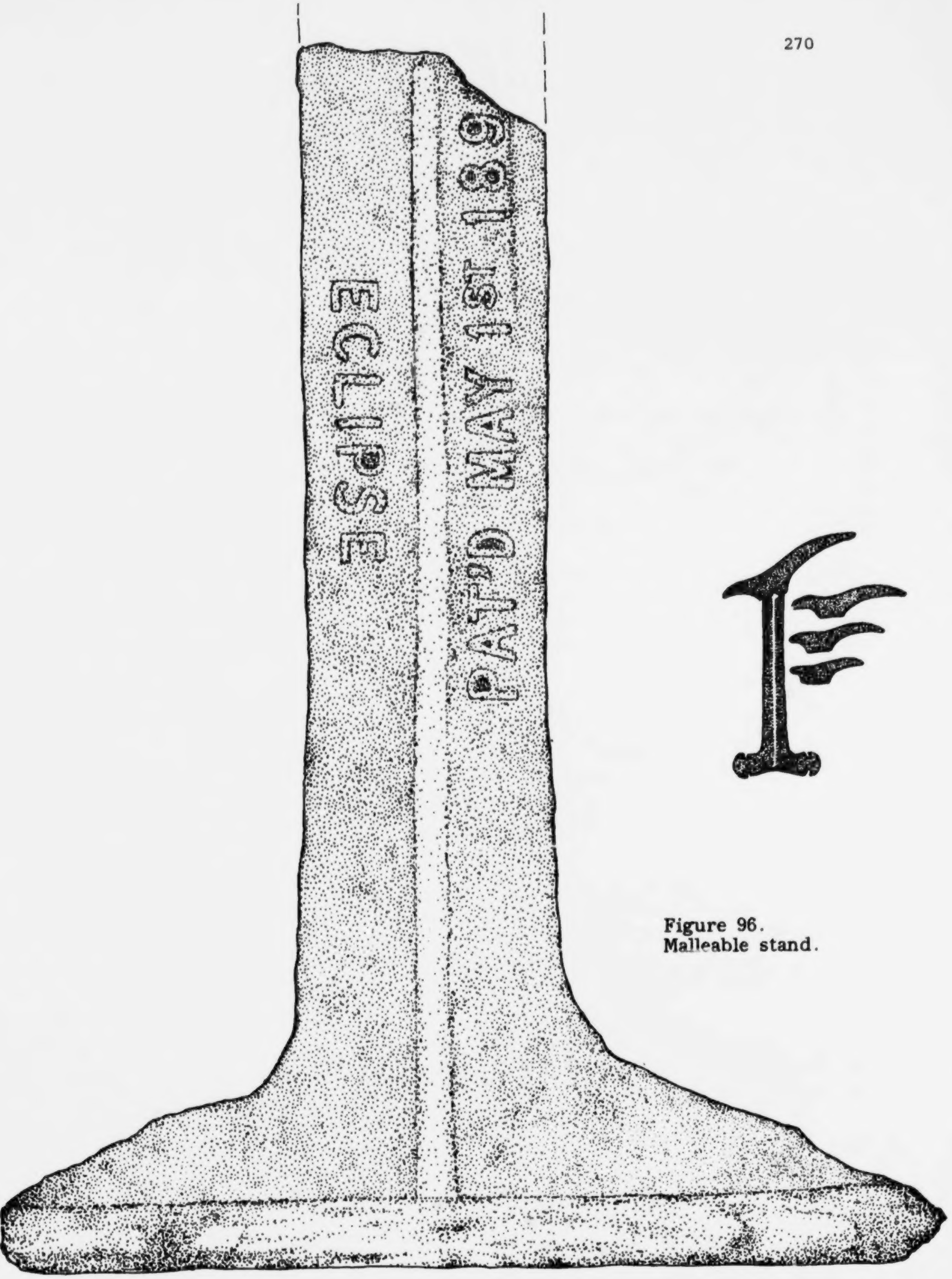

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Figure 96.
Malleable stand.

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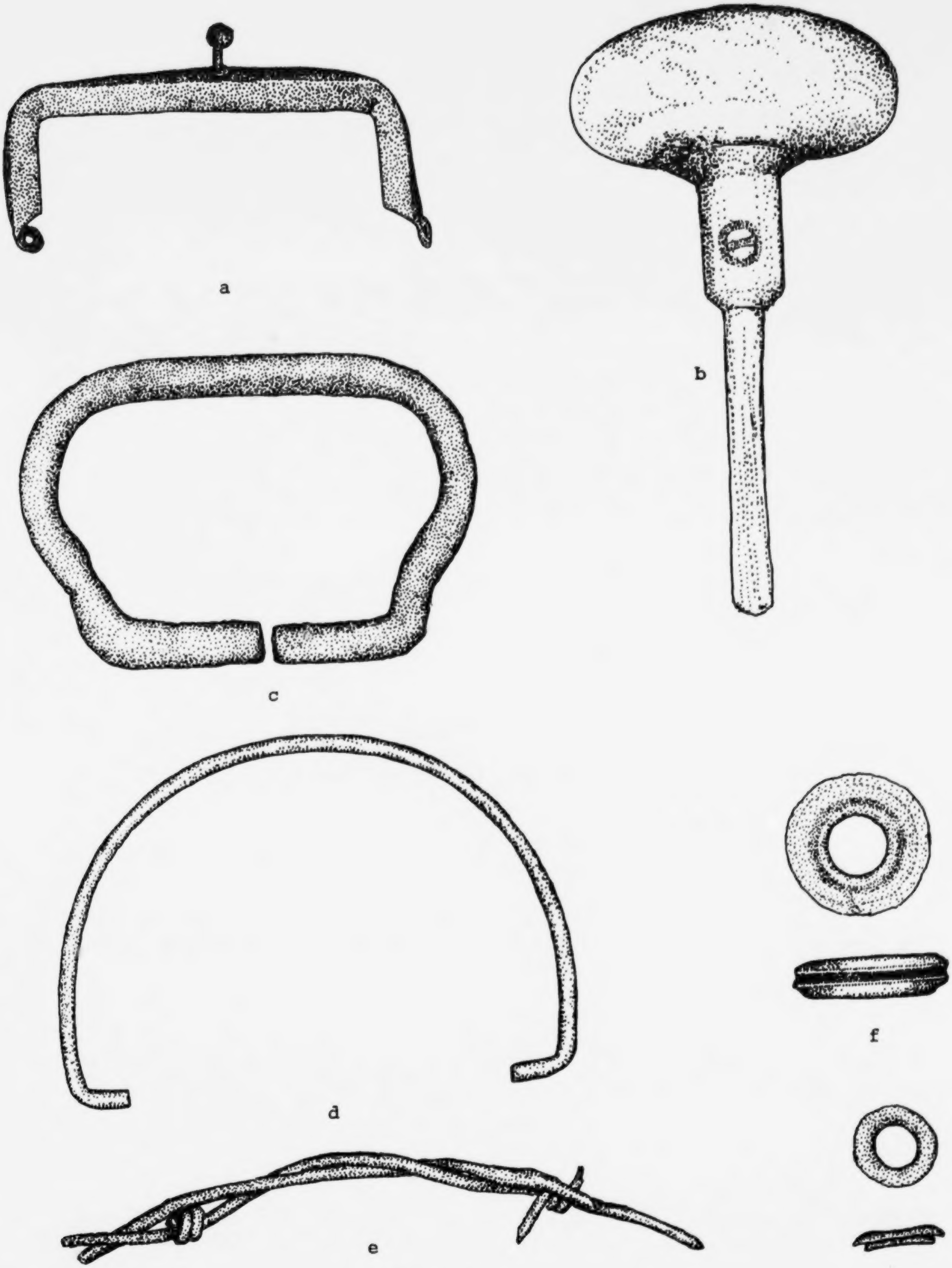

Figure 97.
Miscellaneous metal objects.

Door Knob

The knob from Structure 4 is white porcelain with a metal stem. It measures 2.25 inches in diameter. The shaft that operates the door mechanism is square and measures .25 inches on each side (Figure 97b).

Oil Lamp Burner

This badly corroded and smashed burner consisted of the wick control and chimney holder. Unattached, but present, was the wick guard. On the outer surface of the wick wheel crank an inscription reads "Victor Made In U.S.A." Similar lamp parts are illustrated in the Sears, Roebuck and Co. Catalogue (1925:576). These oil lamp parts are from Structure 2.

Handles

One handle from Structure 4 is a rod metal handle, possibly to a chest or box. It measures 3 inches long and 2.375 inches wide (Figure 97c).

Another handle, made of wire, was originally probably attached to a can or even a bottle. It is 3.75 inches long and was found in Structure 1 (Figure 97d).

Barbed Wire

Several pieces of barbed wire were found in Structure 1. This wire has a two-point barb double twisted around the main wire. The barbs are uniformly spaced at five inches apart. Barbed wire with the barb five inches apart was used for cattle, while hog wire has barbs about three inches apart.

A full spool of 2-point wire weighs 78 pounds and cost $3.45 per spool in 1925 (Sears, Roebuck and Co. 1925:948).

This variety of barbed wire, known as "The Winner," was patented on November 24, 1874 by Joseph F. Glidden of De Kalb, Illinois (Berge 1973:192, and McCallum and McCallum 1965:251) (Figure 97e).

Blacksmiths' Flat Lip Tongs

These tongs are 23.5 inches long, and each side is made from one piece of iron (Figure 95b). The lip is one inch wide. Tongs similar to this one from Structure 4 are illustrated in Sears, Roebuck and Co. (1902).

Eyelets

The largest eyelet, found in Structure 1, was made of copper and measured one inch in diameter. Canvas still remained between the crimped outer eyelet (Figure 97f).

Three smaller eyelets were found in Structure 4 (Figure 97g).

Stove Parts

Many fragments of stove parts were found in Structure 4, including feet, doors, and tops. Most pieces were badly fragmented, as illustrated in Figure 90f-h. One such fragment had a number or date on it--1882.

Unknown

The metal objects that fall into this category are badly rusted or broken pieces of larger objects. They were probably discarded because they were broken. Some of these which had a recognizable form are illustrated in Figure 98.

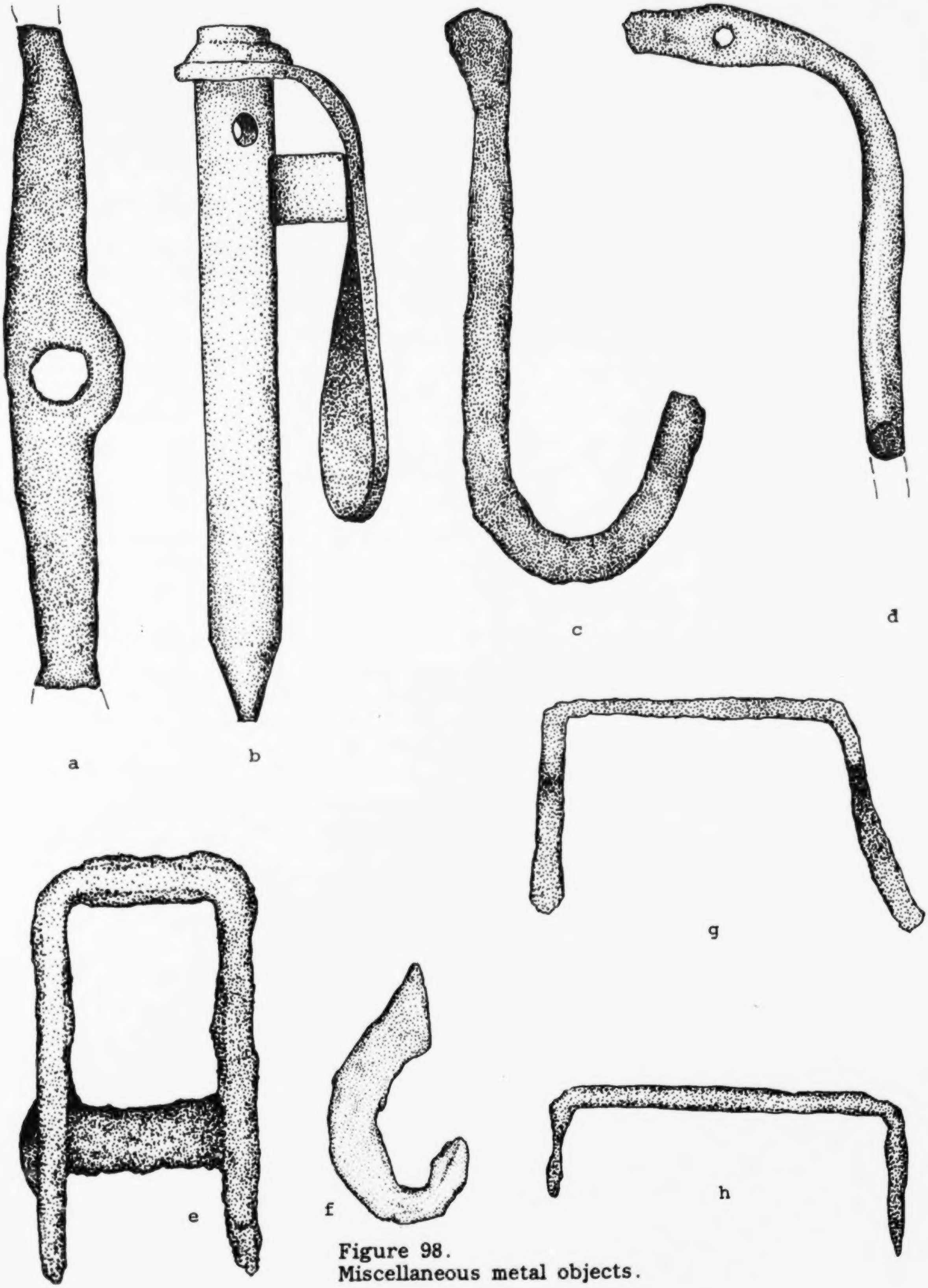

Figure 98.
Miscellaneous metal objects.

CHAPTER 5

OTHER ARTIFACTS

Leather

The leather specimens from the Simpson Spring Station structures, which number 102, are mostly pieces of shoes, i.e., soles, heels, and upper leather. The discovery of leather was distributed as follows: Structure 1, 31 pieces; Structure 2, 4 specimens; Structure 3, none; Structure 4, 53 examples; and, from trenches outside the structures, 14 fragments. See Table 9.

	Structure						Per
Type of Specimen	1	2	3	4	Trenches	Total	Cent
Sole	5	-	-	9	-	14	14
Heel	-	-	-	14	-	23	23
Upper	6	-	-	8	-	14	14
Strap	5	-	-	10	-	21	21
Unknown	6	4	-	12	8	30	29
	31	4	-	53	14	102	100±

TABLE 9
Summary of Leather Specimens

Shoe parts represent 51 percent of the leather pieces recovered. No whole shoes were found, and most of the specimens were badly decayed. The heavy heels and square toes of the soles suggest that most of the shoes recovered are boots, possibly like those described by Wilson (1969:298-299). The soles of the shoes were either stitched by hand or machine, or nailed. Many items were hand-made, which was determined by the roughness of workmanship, such as uneven cutting of the leather, and non-uniformity of stitching and nailing.

The styles of shoes have changed through time as clothes fashions have changed, but not as drastically as in our own time (Wilson 1969:1).

Anderson (1968) presents an outline of shoe improvements during the nineteenth century. It is further listed with some additions (Wohl Shoe Company) as follows:

until	1750 -	Shoemakers worked in their own homes, hand crafting footwear.

- John Dagyr set up the first shoe shop in Lynn, Massachusetts with individual workers doing specific jobs.

1793 - The Harvey Brothers opened the first retail shoe shop in Boston.

1800 - Shoes were made ready-to-wear

- Patent leather was introduced.

c. 1811 - Wooden shoe peg machine made.

1812 - Shoe nails were manufactured in New England to replace the wooden peg; also the lathe was developed.

1829 - Nathan Leonard, Merrimack, New Hampshire, patented the hand operated pegging machine.

- The Shoe-nailing machine was perfected in New England.

1830 - Patterns came into use for shoe cutting, eliminating the cutter at this time.

- Counters, which are thick pieces of leather on the heel, were manufactured as reinforcing.

1844 - Charles Goodyear discovered and patented the process of vulcanization, which included the manufacture of rubber shoes, soles and fishing boots.

1845 - The Rolling machine was used to compress leather, eliminating the lapstone and hammer.

1846 - Elias Howe, Jr., patented a sewing machine, making it possible to stitch shoe uppers rapidly.

1850s The first sport shoes were manufactured with a laced fabric top and a rubber sole, later to be called the "sneaker."

1854 - The Davey Pegging Machine was developed to fasten the sole to the upper with small wooden pegs.

1860 - Lyman R. Blake, Abington, Massachusetts, patented a sewing machine that sewed the sole to the upper shoe. It "left a loop stitch and ridge of thread on the foot side of the insole, and did not stitch the heel or the toe."

- Shoe factories were driven by steam or water power.

- Lasts were developed to distinguish between right and left shoes.

1862 - Colonel Gordon McKay patented improvements on Blake's sewing machine, which enabled the seams to be made completely around the shoe." This invention lightened shoe construction, eliminating pegs or nails. This machine left "stitching on the foot side of the insole."

- Cable nailing machine was used to automatically drive nails, which were attached together at head and point like a cable.

- Eugene Lemercier "formed a screw from a continuous brass wire, forced it into the leather, and cut it off automatically."

1874 - The eyelet-setting machine was developed.

1875 - Charles Goodyear, Jr., perfected the Goodyear Welt Stitcher, which used a curved needle to stitch "the welt to the upper shoe and to the sole at the same time.

- The automatic heeling machine were used for nailing on heels.

1881 - The Buttonhole maker was used.

1888 - Standard shoe sizes were developed.

1899 - Goodyear Sewing Machine Company, Consolidated and McKay Lasting Machine Company, and the McKay Shoe Machinery Company merged into the United Shoe Machinery Corporation.

1904 - Women adopted their own man's pump.

c. 1912 - Manufacturing techniques were standardized: "Goodyear Welt, McKay, turned, standard screw, and nailed."

1915 - Saddle shoes were first worn.

1926 - Cement shoe production by gluing of the sole to the upper shoe.

1934 - Lounging sandals were introduced.

1937 Wedged soles were introduced at this time.

Some examples of leather specimens excavated at Simpson Springs are as follows:

A. Shoe soles

1. Measurements: 26 cm X 7 cm X .2 cm thick.
   Provenience: Structure 1, Room 1

   Description: This fragment has part of the toe and heel missing. There are nail holes which indicate where the heel was nailed, and one nail is still in the toe. Needle holes in the sole are .2 cm long, .8 cm apart and .5 cm from the edge. The lack of uniformity of the needle holes suggest the sole was hand sewn. On the edge in some places, the leather was folded into two layers.

2. Measurements: 4 cm X 3.5 cm X .1 cm thick.

   Provenience: Structure 1, Room 3

   Description: This sole has two cut edges and was sewn parallel to the edge, possibly by machine.

3. Measurements: 12.2 cm X 7 cm X 1.3 cm thick.

   Provenience: Structure 4

   Description: This piece is the front half of a square-toed left shoe. It was nailed and seems to have been resoled, since there is an extra piece of leather nailed to the sole. There are five pieces of leather nailed together at its thickest part.
   Date: c. 1860 +

4. Measurements: 15 cm X 8.5 cm X 1.5 cm thick.

   Provenience: Structure 4

   Description: All the sole is present except for the heel. The bottom still has what appears to be hobnails. An insole and part of the upper are still intact. The shoe was nailed. This sole was part of the right footed 6 or 7 layers of leather.
   Date: c. 1860 +

5. Measurements: 12 cm X 7.5 cm X 1.4 cm X 1.4 cm thick.

Provenience: Structure 4

Description: The sole and insole are present to this front half of a possible left footed shoe. Four layers of leather are nailed together. It has a square toe.
Date: c. 1860 +

6. Measurements: 15.7 cm X 6.4 cm X 4 cm thick.

Provenience: Structure 4

Description: The toe part is missing on this machine-sewn shoe. The heel was nailed on, with some nails still present. The shoe does not appear to have been made for a specific foot.
Date: After 1846

7. Measurements: 10 cm X 4.5 cm X .6 cm thick.

Provenience: Structure 4

Description: On this child's shoe the toe is missing. It was fastened together by wire screws on a Eugene Lemercier machine. It is 2 layers of leather thick, with the heel missing. The heel was 4.5 cm long X 4.2 cm wide.
Dates: c. 1862 or later

8. Measurements: 15.5 cm X 9 cm X 1.4 cm thick.

Provenience: Structure 4

Description: The rear section or heel is missing to this machine sewn sole. A hole in the sole has been repaired several times by nailing leather over it. This pointed toe shoe has four layers of leather, with nails still present.
Date: c. 1862 or later

9. Measurements: 9 cm X 6.5 cm X 1.2 cm thick.

Provenience: Structure 4

Description: All that remains is part of the toe section of the sole. The sole was nailed, with some nails still present.

10. Measurements: 9.5 cm X 5.5 cm X .2 cm thick.

Provenience: Structure 4

Description: This is the arch section of a nailed sole, with one thickness of leather.

11. Measurements: 10.2 cm X 7.3 cm X .25 cm thick.

Provenience: Structure 4

Description: This is the arch section of a left sole, which was nailed. It is one thickness of leather.
Date: c. 1860 +

12. Measurements: 7.2 cm X 4.8 cm X .2 cm thick.

Provenience: Structure 4

Description: This piece is an insole heel segment one layer thick, which was sewn.

13. Measurements: 8 cm X 4.9 cm X .3 cm thick.

Provenience: Structure 4

Description: This is a machine sewn sole, with a channel present. It is one thickness of leather.

14. Measurements: 6 cm X 4.7 cm X .3 cm thick.

Provenience: Structure 4

Description: A very small piece that was nailed, one layer thick.

15. Measurements: 21 cm X 7.3 cm X 1.5 cm thick.

Provenience: Structure 4

Description: This sole is almost complete, with the heel still attached. The insole is still present and nails still hold the shoe together. The sole consists of five layers of leather, while the heel has four. The heel is 2 cm high. The toe is square and appears to have been made for the left foot. It is probably the sole of a boot. Figure 99 a-b.

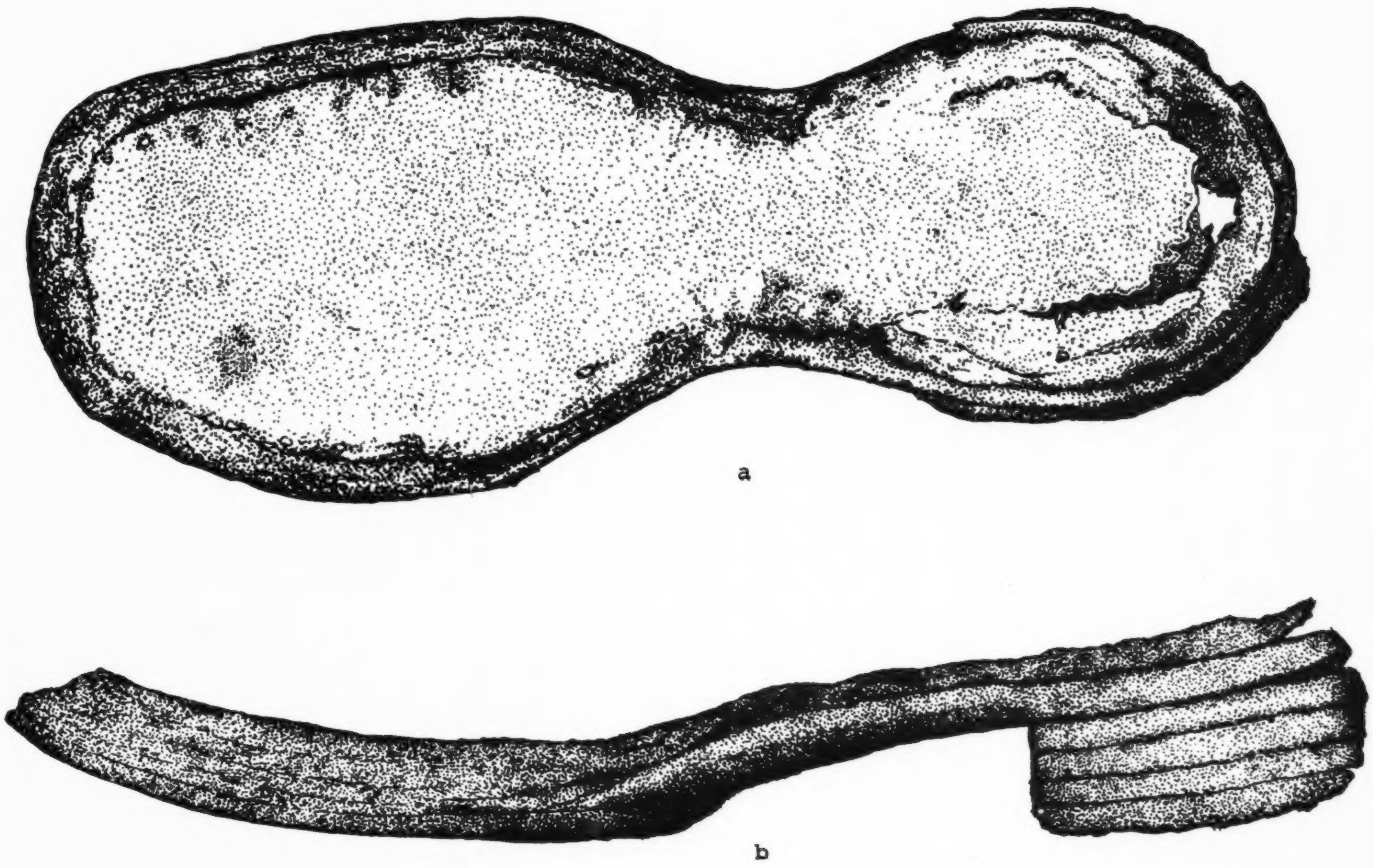

Figure 99.
Shoe sole from Structure 4.

B. Shoe heels

1. Measurements: 6 cm X 4 cm X .2 cm thick.

   Provenience: Structure 1, general surface

   Description: This specimen is about half of a single layer of leather from the heel of a shoe. Along the untorn edges are needle marks .3 cm apart, .2 cm long, and 4 cm from the edge. The uniformity of the sewing suggests that the heel was machine sewn. The heel may have been tacked to the sole by one nail, still present. No other nail holes are present.

2. Measurements: 5 cm X 4 cm X 1 cm thick.

   Provenience: Structure 1, Room 1.

   Description: This heel consists of three layers of rubber connected by short nails.

3. Measurements: 5.5 cm X 5.5 cm X 1.5 cm thick.

   Provenience: Structure 1, Room 1.

   Description: This heel is three layers thick, with nails still present.

4. Measurements: 6.5 cm X 7 cm X 2.5 cm thick.

   Provenience: Structure 1, Room 1

   Description: This heel is two layers of leather thick, attached with many nails to the sole throughout the center. Smaller nails were used on the outside of the heel, while larger ones were used on the inside.

5. Measurements: a. 4.5 cm X 5 cm X 5 cm thick.

   b. 8 cm X 1 cm X .3 cm thick.

   c. 6 cm X 1 cm X .3 cm thick.

   Provenience: Structure 1, Room 2

   Description: All are heel fragments.

6. Measurements: 6 cm X 5.8 cm X 6 cm thick.

Provenience: Structure 4

Description: This nailed heel still has part of the insole attached. It is two thicknesses of leather.

7. Measurements: 6.5 cm X 7 cm X 1.5 cm thick.

Provenience: Structure 4

Description: This rubber heel does not appear to have been nailed or sewn. This suggests that it was glued. Figure 100a.

8. Measurements: 6 cm X 5.5 cm X 2.2 cm thick.

Provenience: Structure 4

Description: This heel is seven layers of leather nailed together. Figure 100b.

C. Shoe Uppers

1. Measurements: a. 4 cm X 11 cm X .4 cm thick.

b. 5 cm X 10 cm X .2 cm thick.

c. 4 cm X 7 cm X .3 cm thick.

d. 8 cm X 18 cm X .2 cm thick.

Provenience: Structure 1, Room 1

Description: All pieces of the upper shoe were sewn at the top and nailed to the bottoms.

2. Measurements: 12 cm X 11 cm X .2 cm thick.

Provenience: Structure 1, Room 2

Description: This piece has no distinguishing cut edges. It appears to be a section of the toe.

3. Measurements: a. 6.5 cm X 1.6 cm X .2 cm thick.

b. 7.5 cm X 1.2 cm X .2 cm thick.

Provenience: Structure 4

Description: These two fragments show the eyelets on a strip of leather which were machine-sewn to the rest of the upper.

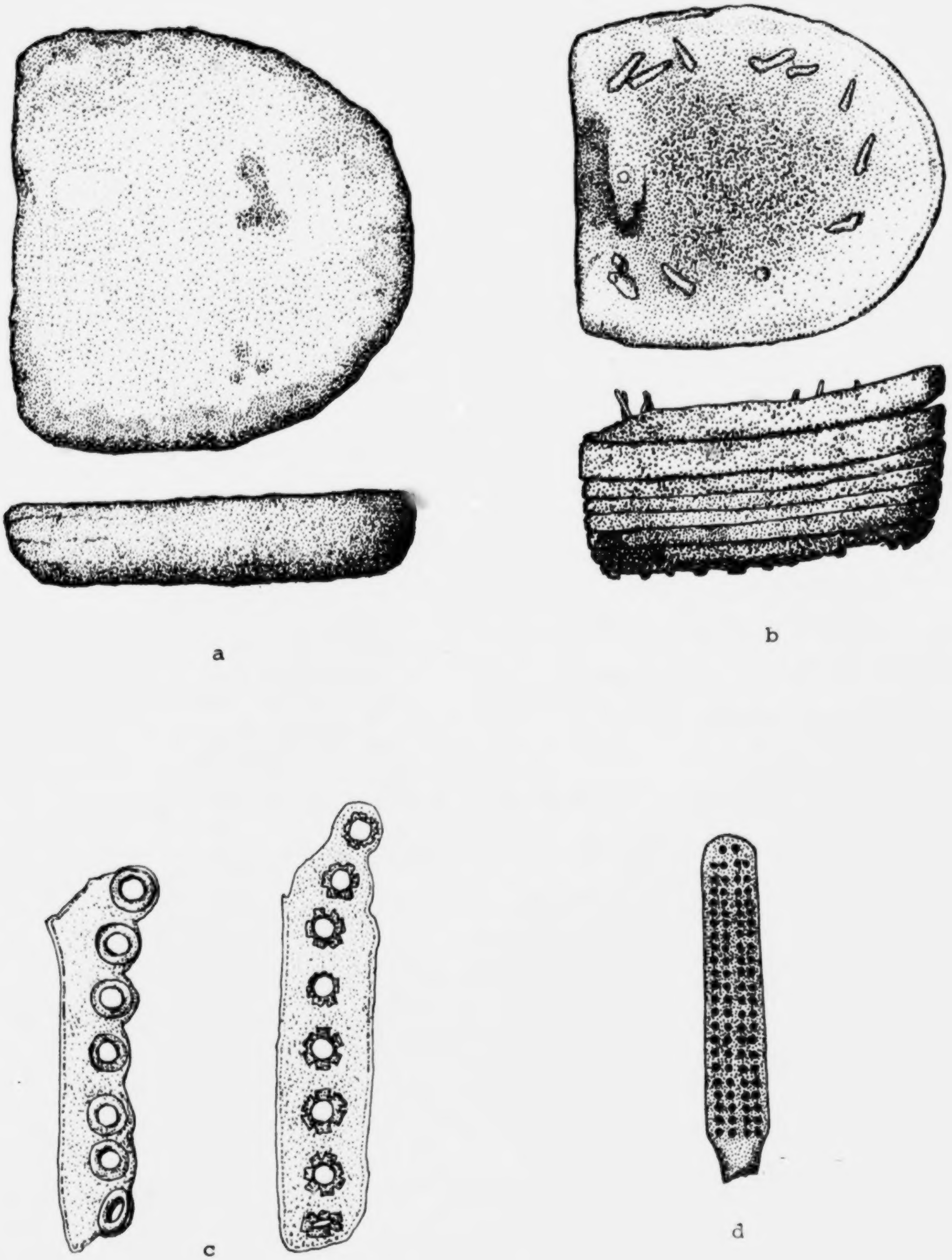

Figure 100.
Leather shoe parts and bone toothbrush.

The eyelets are flared on the inside of the leather. Figure 100c.

D. Shoe Fragments

1. Measurements: 4.8 cm X 2.8 cm X .25 cm thick.

Provenience: Structure 4

Description: One thickness of leather which may be part of a heel. In relief on the leather are the letters "O," "M," and possibly an "A."

E. Belt or Harness

1. Measurements: 12 cm X 3.5 cm X .3 cm thick.

Provenience: Structure 1, Room 1

Description: Two holes are present in one end of this long, narrow strip of leather.

2. Measurements: 11.5 cm X 2 cm X .2 cm thick.

Provenience: Structure 1, Room 1

Description: This strap has two cut edges with a rounded end and two cut holes.

F. Straps

1. Measurements: a. 34 cm X 2 cm X .3 cm thick.

b. 4 cm X 2.5 cm X .3 cm thick.

c. 4.5 cm X 1 cm X .3 cm thick.

d. 18 cm X .8 cm X .3 cm thick.

e. 11 cm X 1 cm X .3 cm thick.

Descriptions: All are cut and some have holes, which suggest that at least some are pieces of a belt or harness.

G. Miscellaneous Pieces

1. Measurements: a. 4 cm X 3 cm X .3 cm thick.

b. 6 cm X 3 cm X .2 cm thick.

	c. 3 cm X 1.5 cm X .3 cm thick.
	d. 5 cm X 3 cm X .2 cm thick.
	e. 13 cm X 6 cm X .1 cm thick.
Provenience:	Structure 1, Room 1
Description:	These pieces have no cut edges or holes. Other non-description pieces were found in Room 1.

Stone

The stone used in the construction of Structures 1, 2 and 3 is from local outcrops. In Structure 1 large blocks of basalt were used for the foundation. In Structure 2 the similar basalt blocks were used in construction, along with some volcanic tuff. The quantity of excess rock around the site suggests that the walls of this building were also built of stone.

Structure 3 was not constructed of basalt blocks, as were 1 and 2. The building stone in the walls was worked volcanic tuff, along with some stream cobbles. The stones appear to have been quarried in relatively flat section with at least one smooth face.

It is not known if there was mortar used in Structures 1 and 2, although it seems that the construction of Structure 1 would have required mortar. Structure 2 may not have needed mortar in the foundation. The mortar in Structure 3 was made of volcanic tuff and possibly lime. The mortar is crumbly and appears to have been mixed at the site, since fragments of glass and pottery are present in it.

The only other stone found at the site was seven small obsidian flakes--four from Structure 1 and three from Structure 2. Also two flakes of white chert were recovered from Structure 2. Similar flakes of obsidian were observed in a small cave near the excavated structures. Discovered within Structure 1 was a small sherd of prehistoric pottery painted black-on-white on the outside surface and plain white on the inside. It probably belonged to the ancient Fremont culture.

Cement

The foundation of Structure 3 was constructed of cement, and although no chemical analysis of the composition of this footing material was made, its hardness suggests that it was constructed from portland cement rather than natural cement. For dating purposes, a brief chronology of the cement industry is presented (Eckel 1905:1-3; Hadley 1945:7-26; Blanks 1955:3-10; and Larson 1963:9-16):

Mud used for binding masonry at an early time.

Egyptians used a gypsum binder for the construction of the pyramids; they burned nummulitic limestone.

Carthaginians used natural cement for the construction of an aquaduct across northern Africa.

Greeks knew about cement but preferred large blocks of stone, unconnected by a binder.

In Mexico and Peru the native inhabitants used a natural rock cement as mortar in their structures of stone.

The Romans living near the base of Mount Vesuvius found that volcanic ash, calcined by heat, produced pozzuolana, which was pulverized and mixed with slaked lime and sand to make "hydraulic cement." An accomplishment which they owe to the development of concrete was arch-vaulting.

The Byzantine Empire during the middle ages used brick and stone and had, apparently, lost the art of making concrete, as the Romans had done earlier.

1756 The making of hydraulic cement as the Romans had manufactured it was rediscovered. John Smeaton was commissioned by British Parliament to build the Eddystone Light off the coast of Plymouth, England. Using a limestone with a high percentage of clay, he proved that, after careful burning at low temperatures, a lime that could be slaked and hardened under water could be produced.

1796 Joseph Parker patented "Roman Cement," a natural cement made by burning clay nodules at low temperatures and grinding them to powder to produce a hydraulic cement.

1802 This year marked the beginning of the cement industry in France.

1810 Edward Dobbs was granted a British patent for mixing chalk or pure limestone with clay, burning it in an oven at low heat and grinding the clinker into cement.

1813 Vicat made cement of limestone and clay.

1817 The Erie Canal was started with use of natural cement. The first use of natural cement was mainly in canals, locks and bridges.

1822	James Frost made cement of limestone and clay.
1824	Joseph Aspdin was granted a patent by George IV for portland cement. He calcined limestone, added clay with water, burned it at high temperatures, and ground it into a powder. Where Smeaton and Parker haphazardly proportioned their ingredients and fired them at a low temperature, Aspdin strictly measured his and burned them at very high temperatures.
1825	The first commercial-scale portland cement works was opened by Aspdin at Wakefield, England.
1828	The Thames River tunnel was made of portland cement.
1844	Joseph Goodrich transported natural cement by wagon to Milton, Wisconsin to build the Milton House, believed to be the first architectural concrete building in the United States.
1845	The firm Robbins, Aspdin & Company was formed.
1850	A plant in Coplay, England made natural cement.
1852	The first German portland cement was made.
1859	London Drainage Canal built of portland cement which helped engineering purposes.
1868	A slight importation of portland cement was made into the United States.
1871	The first manufacture of portland cement in U.S. was by David O. Saylor.
1871	The first reinforced concrete bridge built in the United States was at Prospect Park, Brooklyn.
1872	The Eagle Cement Company was built in Kalamazoo, Michigan. It lasted until 1882.
1875	The first reinforced concrete structure was constructed.
1877	The first reinforced concrete factory was built this year.
1878	92,000 barrels of cement imported into the United States.
1885	554,000 barrels imported, which marked an increase in the use of portland cement.
1885	The Mathey Cement Company was incorporated in New York.

1886	The first rotary cylinder was used for burning cement.
1889	The first portland cement was made by the rotary kiln method.
1890	The first public reinforced concrete building was Stanford University Museum, built this year.
	17 plants were producing cement in the U.S.
1891	The Keystone Company changed to the Atlas Cement Company.
1891	The first concrete streets were built.
1897	Experiments were started using blast furnace slag to produce true portland cement.
1900	It wasn't until this year that portland cement sales outdid natural cement sales.
1904	The Baltimore fire and San Francisco earthquakes (1906) resulted in marked impetus to reinforced concrete construction.

This chronology suggests that the more durable cement would not have been readily available for construction in the West until after the turn of the twentieth century. Only by means of a careful examination of the cement composition, particularly in terms of measured quantities of clay and lime and quality of these ingredients, could a distinction between natural cement and portland cement be made.

Wood

No wood samples were found in Structures 2 or 4. Within Structure 1, Room 1, a few small pieces of burnt wood were recovered. It is not known if this wood was part of the roofing or fire wood. It was identified as *Juniperus* or (Juniper).

Most wood specimens came from Structure 3. The sign marked "Utah" was made of pinyon pine (*Pinus edulis*), and there were other smaller pieces of pinyon pine about 3 to 5 centimeters thick. Within the walls were burnt ends of small juniper logs about 10 to 20 centimeters in diameter, which may have been part of the roof support. Large burnt logs found on the ties used for the floor of this small building were juniper also. Above the floor area in a section which had not been burned was considerable shredded juniper bark, possibly part of the roof covering.

Apparently local timber was used where needed in the construction of at least Structure 3.

Cloth

Ten fragments of cloth were unearthed from Structure 1, Room 1, on the surface. These cloth fragments were badly decomposed and partially burned. They were identified by Elizabeth Leichty of the Clothing and Textiles Department, Brigham Young University.

Cloth represented by these ten pieces are from two garments. One is a glove fragment of cotton in a twill weave. The other fragments are a loose weave burlap of jute in a plain weave.

Bone

There were 1155 bone specimens collected during the excavation of Simpson Springs (Table 2). Most of these bones came from Structures 1 and 4--445 and 505 respectively; while 60 were found in Structure 2, and 27 in Structure 3. The remaining bones, or 118 specimens, were recovered in various trenches. Most of these bones were so fragmented, burned or small that they could not be identified. Many of the bones had been cut with a saw or knife, indicating that they had been butchered.

Over 200 bones were compared with the Brigham Young University Osteological collection by Steven Robison and Sam Webb (see Appendix A) and identified to the genus level, except for the genus *canis*. Bones from Structure 3 were not used, since so few were identifiable. The following genera were identified: sheep (*Ovis*), cow (*Bos*), chicken (*Gallus*), pig (*Sus*), cottontail rabbit (*Sylvalagus*), jackrabbit (*Lepus*), skunk (*Mephitis*), squirrel (probably a ground sqirrel, *Seiurus*), dog (*Canis familaris*), coyote (*Canis latrans*), horse (*Equus*), bobcat (*Lenx ruffus*), and several unidentified rodent bones. No human bones were found at these sites.

Sheep bones represent, by far, the greatest number of bones recovered, then cow, chicken and pig, in that order (Table 10). Domestic animals represented are sheep, cow, chicken, pig, dog and horse, while wild animals include cottontail, jackrabbit, skunk, squirrel, coyote, bobcat, and rodents. Only domesticated animals' bones were cut or burned--sheep, cow and chicken.

The cuts of meat identified from cut sheep and cow bones were made by Sam Webb. His descriptions of these cuts of meat are presented in Appendix B. (See Figure 101).

It is interesting to note that (1) the only fowl bones identified are those of chickens and (2) there is an absence of fish and deer bones. If wild animals supplemented the diet of the station keepers, one might expect an occasional deer or wild fowl. An occasional meal of fish was possible. The nearest body of water where these fish could have been obtained is Utah Lake, several miles away.

It would seem that smaller wild animals were hunted or trapped, such as cottontail, jackrabbit and squirrel. Some of these wild animals may have died naturally, burrowing under the structure floor, such as

	STRUCTURE						
	1						
	ROOM						
TYPE OF ANIMAL	1	2	3	2	4	TRENCHES	TOTALS
Sheep	60	21	5	3	39	14	142
Cow	9	2		4	8	7	30
Chicken	6	18	1		2	2	27
Pig	1					1	4
Cottontail	2	1				1	4
Jackrabbit	13	4	2		1		20
Skunk						1	1
Squirrel	1	3	1				5
Dog	3				1		4
Coyote	1						1
Horse					1		1
Bobcat	1						1
Rodents	1	1					2
	98	50	9	7	53	25	242

TABLE 10

SUMMARY OF IDENTIFIED ANIMAL BONES

skunk or squirrel. Possibly predators like the coyote and bobcat occasionally appeared around the station, possibly later when sheep were abundant in the area, and were killed by concerned herders.

The number of identifiable bones is not adequate to provide a count of the number of individual animals represented by the collections.

Animal bones which appear to have had the flesh eaten, suggested by either being cut or burnt, are sheep, cow and chicken. Cut bone is represented equally between sheep and cattle, although many more sheep bones were recovered than cow, while chicken is only slightly represented. This bone count is probably not representative of the actual animals eaten in quantity or identity. The structures excavated represent living areas and not trash areas. If both types of areas had been equally represented by excavation, more reliable understanding of the types of animals utilized, either domestic or wild, would be available for study.

Due to the disturbance of the soil, lack of stratigraphic detail, and artifact association, dating in relation to types and number is not plausible.

The only crafted artifact of bone is the bristle end of a toothbrush (Figure 100d).

CHAPTER 6

DATING THE STRUCTURES

The archaeological dating of the four structures at Simpson Springs is based on the classification and correlation of all excavated artifacts, i.e., architecture, glass, ceramics, metal and other specimens. Due to the mixture of the thin soil at Structures 1 and 2, stratigraphy could not be used for relative dating of the objects or floors. Structure 3 did have soil depth, but the differences in soil and artifacts did not vary throughout the sequence. Over half of the objects recovered at this site were nails, and one-third were flat glass used in window panes. Of the 493 artifacts unearthed in this structure, 103 are potentially datable. Structure 4, although comparatively well below the ground surface, appeared to have been used as a dumping area for trash; it lacked a clear stratigraphic profile. Well over half of all the artifacts excavated from all four sites were encountered within this ruin, and it therefore provides the best dating evidence.

Structure 1

Architecture

This building was constructed of basalt locally obtained from Simpson Mountains. All that remained intact of the three-room structure was a shallow stone foundation. Surface rock around the area suggests that the entire walls were constructed of the local stone. Room 1 was a sunken room while the the central room (Room 2) was the original construction with adjoining rooms on each side abutted to it. Only part of the foundation of Room 3 remained in its original position. Architectural detail provided no evidence for dating.

Glass

No whole or identifiable bottles were found in this structure. One bottle base (Figure 60d-f) provides a date of 1880-1914, based on the purple color of the glass. The insulators found here are of a very early type, patented in 1851.

Metal

Cartridges found in this area provide good data for dating. They date as follows:

Room 1	
Rimfire	
.22 Long Rifle Super X (Figure 79a)	1900-on
.22 Long Rifle R (Figure 79d)	1900-on
.22 Long Rifle F (Figure 79f)	1917-on
.22 Long Rifle U (Figure 79g)	1890-on
.22 Long Rifle U Hi Speed (Figure 79h)	1890-on

.22 Extra Long H (Figure 79l)	1880-on
.32 Long (Figure 79m)	1861-on
.44 Long (Figure 79o)	1860-1920
.50 Remington Navy (Figure 79p)	1865-1870
.44 H. (Raised)(Figure 79q)	1860-1934
Centerfire (External)	
.32 S & W (Figure 79s)	1918-on
.44 W.C.F. WRA Company	1868-on
.25-.35 W.C.F. WRA Company	1895-1945
.30 T W 25 (Figure 80e)	Before 1915
.30 S 5 3 L (Figure 80f)	Before 1915
Room 2	
Rimfire	
.22 Long Rifle C (Figure 79e)	1917-on
.22 Long Rifle F (Figure 79f)	1917-on
.22 Long Rifle U (Figure 79g)	1890-on
.22 Long Rifle U Hi Speed (Figure 79h)	1890-on
.38 Short (Figure 79h)	1865-c1940
.44 Long (Figure 79o)	1860-c1920
.44 H (raised) (Figure 79q)	1860-1934
Room 3	
Rimfire	
.22 Long Rifle U (Figure 79g)	1890-on
.22 LongRifle U Hi Speed (Figure 79h)	1890-on
.38 Short (Figure 79n)	1865-1940

None of the other metal artifacts are useful for specific dating. Nails provide some data, since more square nails that date after 1855 were found in this structure than any other. Wire nails replaced square nails around 1890-1895.

Ceramics

No ceramics were recovered at this structure.

Evidence for assigning an absolute time range to this structure is limited. The architecture is primitive but of a type that could have been built at any time. In the floor of room 2, an iron rod had been buried in the bedrock. If this feature had been used as a ground for the telegraph, it would suggest the building was in use between 1861 and 1869.

The only glass evidence useful for dating this structure is one bottle base dating between 1880-1914. The insulators, although not glass, are probably the best means of dating the structure. Patented in 1851, the ramshorns insulators were used in the construction of early telegraph lines but are rare today. They were probably rapidly replaced with the invention of glass insulators, praticularly the pony and double petticoat and others by such companies as Brookfield and Hemingray.

Metal artifacts generally provide little evidence for dating of structure 1; however, cartridges do suggest a range for each room. The early cartridges of room 1 provide a range between 1860 and 1870, with two dating as late as 1934 or 1920. A second range of cartridges dates to after 1888. Room 2 cartridges suggest the same range of dates as do those of room 3. These dates for the latter two rooms are suggested, however, by less evidence or fewer numbers of cartridge examples. The .22 caliber cartridge cases are mostly newer types.

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Due to the lack of adequate data, no dates are suggested based on ceramics. In summary, the datable artifacts suggest the following time periods:

Architecture	No dates
Glass	
Insulators	1851-1865
Bottle base	1880-1915
Metal	
Cartridges (early)	1860-1870
Cartridges (later)	1888-1940
Cartridges (new)	recent
Ceramics	

The total of 1432 specimens recovered from Structure 1 represents 19.49 percent of all artifacts recovered from the excavation at Simpson Springs. Of this total, 313 objects are flat glass, 262 are miscellaneous fragments of metal, and 505 are either wood, bone, leather, or cloth. These undatable artifacts number 1,080, or 75 percent of all artifacts recovered from Structure 1 alone. A further breakdown reveals that 34 of the 88 glass fragments are useful for dating, as are 145 nails and staples. These remaining artifacts, or 179 specimens, are generally datable. Specific dates are available for even fewer objects.

The oldest datable objects from this ruin are the ramshorns insulators patented in 1851. This suggests the earliest possible usage of Structure 1 to be this date. The latest date is provided by modern cans, bottle glass and cartridges found on the site surface. However, this later use appears to be recreational rather than domestic.

Further use of the site between 1851 and recent times is indicated by cartridges dating from 1860 to 1870 and 1888 to 1940, and glass dating from 1880 to 1915.

Due to the lack of datable artifacts, the time range of occupation and miscellaneous use of this structure is general--1851 to present.

Structure 2

Architecture

The construction of this building utilized a section of the tuff outcrop. The foundation was circular, made of local stone. The lack of stone around this site, other than that which was in the foundation, suggests that the walls were not of stone. The stone is of the same type used in Structure 1. This site represents one room only.

Glass

Two bases of bottle glass were found in this structure. One (Figure 67b) dates 1880-1913, inferred from its color changes caused by manganese content. The other fragment (Figure 67e) was manufactured of "black" glass and could date at least before 1880. The real clue to dating this site may be the discovery of three fragments of unthreaded insulators which date prior to 1865.

Metal

The relatively few nails in Structure 2 seem to indicate a lack of framing, floor, roof or walls of wood. The only nails recovered were eight square nails. One would expect that if there was a wooden structure over this foundation and it was destroyed or dismantled, nails would have been left behind.

The following cartridges were found in this structure:

Rimfire	
.50 Remington Navy (Figure 80p)	1865-1870
Centerfire	
.38 S & W SH U.M.C. (Figure 80u)	1877-1911
.38 (no mark) (Figure 80v)	1875-1900
.44 W.C.F. WRA Co. (Figure 80y)	1908-on
.25-.35 W.C.F. WRA Co. (Figure 81d)	1895-1945

Ceramics

No hallmarks were on the 20 sherds recovered from Structure 2. The sherds of Ironstone and Pearlware do not allow dating in any precise detail.

Architecture does not suggest any range of absolute dates. Its similarity in construction technique to Structure 1 may indicate an early building date.

Undoubtedly the unthreaded insulators found only in this structure hint at an original construction date prior to 1865.

Although there were few nails, all were square cut, a manufacturing technique that ranges from 1830 to c. 1890.

The few cartridges from the structure range in date from 1865 to recent times. However, one cartiridge, .50 Remington Navy, has an early manufacture date of the late 19th Century.

Therefore, artifacts from Structure 2 may date as follows:

Architecture	No dates
Glass	
Insulators	Before 1865
Purple glass	1880-1915
Black glass	Before 1880
Metal	
Nails	1830-1880
Cartridges (early)	1865-1870
Cartridgles (later)	1875-1911
Ceramics	No dates

The artifacts unearthed at this site, 235, represent only 3.29 percent of all artifacts from Simpson Springs. From this total the number of datable artifacts is few. This group would include purple glass, black glass, cartridges, cans and nails. Approximately 40 of these specimens, or 17.02 precent of those found in Structure 2, are of the datable type. The bottle dates come from glass, cartridges and nails. The tin cans are badly oxidized and are relatively recent. None of the can fragments were situated precisely on the direct floor.

The earliest dates are derived from the unthreaded glass insulator fragments, which date prior to 1865. Black glass dates generally prior to 1880, while purple glass belongs to the 1880-1915 time range. All nails, although few, are machine-cut square nails dating between 1830 and 1880. Cartridge types suggest a time period between 1865 and 1911, or 1945.

As with Structure 1, the dating of this structure is based on a small quantity of datable artifacts. The more recent objects are probably those left behind by individuals passing through or recreating in the area. For Structure 2, the earliest artifacts date prior to 1865 and generally end about 1911.

Structure 3

Architecture

The cement foundation of this building was laid approximately one foot under the ground surface. The subsurface floor was made of dirt laid over with railroad ties. The walls were constructed of flat stone with a tuff mortar. The partial burning of some ties, possible burnt roof beams on the floor, and a layer of burnt wood and bark above the floor, indicate the method of destruction of this structure.

Glass

No whole or identifable bottles were unearthed here, nor were there any bases or closures. No other glass was datable.

Metal

Significant to the dating of this one room building are the number of wire nails recovered (229) as compared to square nails (none). The wire nails replaced the square nails around 1890-1895. All the date nails found within the railroad ties are embossed with the number "23." This date indicates that the ties were laid on the track in 1923. If a railroad tie lasted ten years, then these ties could have been placed on the floor in approximately 1933.

The following cartridges were found in Structure 3:

Rimfire	
.22 Short U Hi Speed (Figure 80j)	1930-on
Centerfire	
.44 W.C.F. WRA Co. (Figure 80g)	1908-on
.2-.35 U.M.C. (Figure 81c)	1895-1911

Ceramics

The only ceramic fragments from this excavated area are Pearlware; however, the sherd lacked hallmarks. The thinness and quality of these sherds suggest a much later date than when Pealrware was first introduced in 1779.

The location of cement footings in Structure 3 this far west suggests that the foundation was laid after the turn of the century. The construction of the walls with flat stones does not resemble techniques used in Structures 1 and 2.

None of glass, either bottle or flat, had attributes for dating purposes.

The fact that all the nails recovered from Structure 3 were round, wire nails suggest a date in the twentieth century. The date nails could date to after c. 1930. Cartridges further substantiate the above time period.

Ceramics are of no help in providing reliable dates of use.

Artchitecture	
Cement	20th Century
Glass	No dates
Metal	
Nails	1890-on
Date nails	1923
Cartridges	1895-on
Ceramics	No dates

The evidence for dating from this foundation is relatively straightforward even though 493 specimens, or 6.71 percent of all artifacts, were the total recovered. All datable artifacts clearly suggest dates after the turn of the twentieth century.

Structure 4

Architecture

The outline trench of this structure lies about 9 feet north of Structure 3. More evidence was found in this subterranean structure for dating than in any of the other three. No evidence of walls of stone, brick, logs or planks was evident; in fact, the only feature other than the intrusion was a deeper trench in the northwest corner. This rectangle intrusion may have been a well, since water flowed into it rather freely. Possibly, construction materials were removed at the time of destruction. The mixed nature of the artifacts suggests that the hole was used as a trash dump. It is thought that the artifacts date close to the time of use of the structure.

Glass

Whole Bottles	
Chicago Fancy Brandy (Figure 441)	1880-1913
Ohio Brandy (Figure 44b-e)	1897-1920
Hayner Distilling Co.	1865-1920
bottle patented	1897
Shoo-fly flask (Figure 44d)	1880-1925
Shoo-fly flask (Figure 44e)	1880-1913
Brandy flask (Figure 44f)	1860-1913
Bi-metalic flask (Figure 45a-b)	1880-1913
Flask (Figure 45c-d)	1860-1913
Flat Whiskey (Figure 45e-f)	1880-1913
Maryland Glass Corp	1907-
Trademark	1916-
Flat Whiskey (Figure 45g-j)	1860-1913
Miniature Whiskey (Figure 46a)	1880-1913
Champagne (Figure 45k)	1880-1913
Export Beer (Figure 46b)	1880-1913
Champagne Beer (Figure 46c-d)	1895-1913
Champagne Beer (Figure 46e)	1895-1913
William Franzen and Snow	1900-1921

Patent Medicine (Figure 46f-i)	1800-1915
Chamberlain & Co.	1879-1900+
Patent Medicine (Figure 47a-c)	1880-1913
Round Prescription (Figure 46j-k)	1880-1913
Lyon Manufacturing Co.	c.1860-
Bromo-seltzer (Figure 46 l-m)	1880-1913
Emerson Drug Co.	1880-present
Cobalt blue bottle	1880-present
Prima Oval prescription (Figure 47d-e)	1880-1913
Dr. Sheldon's Magnetic Liniment	1870-
Jamaica Ginger (Figure 47f)	1860-1913
French Square prescription (Figure 47g-h)	1880-1913
Maryland Glass Corporation	1907-?
Trademark	1916-?
Mason Jar (figure 47i-j)	1860-1913
Squat Columbia Preserve (Figure 48a-b)	1880-1913
Kerr Glass Manufacturing Co.	1904-1909
Economy Jar	1909-1950
Cylinder Ink (Figure 47k-l)	1880-1913
Carter Ink Co.	1850-present
Cone Ink (Figure 47m)	1880-1913
Obelisk Olive (Figure 48c-d)	1880-1913
H. J. Heinz	1860-present
Trademark	1888-?
Plain Round Preserve (Figure 48e-f)	1880-1915
Missouri Style (Figure 48g)	1880-1913
Fairmount Glass Works	1898-1945
Trademark	1898-1930
Dewey Preserve (Figure 48h-i)	1880-1913
Chicago Chow (Figure 49a)	1880-1913
Oval Ring Peppersauce (Figure 49b-c)	1880-1913
Illinois Glass Co.	1873-1929
Trademark	1900-1916
Oval Tooth Powder (Figure 48j)	1880-1913
Straight Mustard (Figure 49d)	1880-1913
Oblong Pickle (Figure 49e)	1880-1913
Decagon Catsup (Figure 49f)	1880-1913
Restorable Bottles	
Tall Seal Brandy (Figure 50a)	
Turn Mold Cognac (?) (Figure 50b)	
Malt Whiskey (Figure 50c-d)	1880-1913
Duffy Malt Whiskey Co.	c. 1884-1900
Trademark	1886-?
Shoo-fly flask (Figure 50e)	1880-1913
Magnolia flask (Figure 51a-b)	1880-1913
Export Beer (Figure 51c)	1880-1913
Export Beer (Figure 51d-e)	1880-1913
Adolphus Busch Glass Manufacturing Co.	1886-1928
Paneled Schnapps (?) (Figure 52a-c)	1880-1915
C. W. Chesley & Co.	1872-1880
Shoo-fly flask (Figure 52d-f)	1880-1915

Homer Williams and Alfred Wright	1820-1917
Panel (Figure 50f-h)	1880-1915
H. E. Bucklen & Co.	1878-1890+
Rectangular Tablets (Figure 51f-i)	1880-1913
Ayers Pills	c. 1846
Trademark	1843-present
Panel (Figure 51j)	1880-1913
D. Ward's Medical Co.	1885-present
Catsup (Figure 51k)	1880-1913
T. A. Snider Preserve Co.	1884-?
Catsup (Figure 52g-h)	1880-1913
Curtice-Burns Inc.	1867-present
Straight Carboy (Figure 53a-b)	1880-1913
Bases	
Figure 44a	1880-1913
Figure 44b-c	1897-1920
Figure 60c-f	1880-1915
Figure 61a-b	1880-1915
Figure 62b-c	1880-1913
Figure 62d	1905-1916
Figure 62e	1881-1905
Figure 62f	1881-1905
Figure 63a	1900-1921
Figure 63b	1880-1913
Figure 63f	1932-1943
Figure 63g	1880-1913
Figure 64b	1890-1916
Figure 65a	1916-1929
Figure 66a-c	1906-1915
Figure 65b	1880-1925
Figure 65c-e	1880-1925
Figure 67a	1881-1925
Figure 67d	1880-1915
Metals	
Rimfire	
.22 Extra Long V (Figure 79k)	1880-on
Centerfire	
.38 Long WRA Company (Figure 79k)	1875-1900
.38 W.C.F. WRA Company (Figure 79w)	
.44 C.F.W. U.M.C. (Figure 79z)	c. 1908-1911
.44-40 Peters (Figure 79aa)	1870-on
.44-40 V.M.C.	1878-1911
.45 Colt U.M.C. (Figure 79bb)	1873-1911
.38-55 WRA Company (Figure 79cc)	1908-on
.45-60 W.C.F. WRA Company (Figure 79dd)	1880-1935
.30 U.S.A. R.E.M. - U.M.C. (Figure 79ee)	1911-modern
.30-.30 U.M.C. (Figure 80a)	1895-1911
.25-.35 W.C.F. WRA Company (Figure 80d)	1895-1945
Shotgun Shell	
No. 12 New Rival Winchester (Figure 80a)	1901-modern

The hole-in-top cans were made before 1902, while many items of horse trappings are comparable to those in Sears catalogues at the turn of the century. Wire nails, which dominate the types found in this structure, were replaced around 1890-1895.

Ceramics

The general types of Earthenware and Stoneware provide general dates to this structure. For example, little information is available for Redware; but Brownware dates to the late nineteenth century; Ironstone was introduced in 1813; Pearlware was made beginning in 1779; Transferware was invented in 1752; Decalware had its beginnings in 1860; and flown-blue was popular c. 1870.

The manufacturers' hallmark provide the best dates:

Burford Bros.	1879-1900
J & G Meakin	after 1891
Dresden	1894
Knowles, Taylor & Knowles	from 1872
Smith and Ford	late 19th century
Laughlin	est. 1874
Anthony Shaw	from 1850

The architectural data do not provide a means for dating the underground structure of this site. The earliest possible date for glass is 1860, while the latest is 1928. According to Newman's (1970) dating scheme, the bottles consistently range from 1880-1913. Cartridges suggest a date after 1870, and ceramics date to after 1872. A summary of the data is as follows:

Architecture	no dates
Glass	
Bottles	1880-1913
Metal	
Cartridges	after 1870
Ceramics	after 1872

More datable artifacts were recovered from this site than any of the others; in fact, 62.73 percent of all artifacts discovered in the four structures came from this excavation. Bottles, ceramics, and cartridges provide the relatively secure date of the turn of the century.

Historical Overview of Simpson Springs

The possiblity of dating the four structures excavated at Simpson Springs is limited, particularly for the earlier foundations. There were not enough artifacts from Structures 1, 2 and 3 to conclusively date each building. Considerable artifacts were recovered from Structure 4, so many that relatively secure dates of occupation are suggested. The problem of dating the first three ruins is the lack of artifacts, because either not enough items were preserved or the occupants were conservative with regard to what they threw away or reused. Another possibility is that trash areas were not located and therefore not excavated.

Although the structures themselves were relatively undisturbed, areas around them had been disturbed, most likely by artifact hunters. Sheep herders, CCC personnel, four-wheel vehicle drivers, motorcyclists, curiosity seekers or passers-by may have all added to the gradual disturbance through the years, particularly those times when the route was not supervised by government employees. In areas at Simpson Springs, considerable earth moving has taken place, possibly by the military, since the gunnery range of Dugway Proving Grounds is nearby, and leveled areas near the sites appear to be gun mounts.

Therefore, dating of the structures is based on the chronology of artifacts unearthed and not on stratigraphic sequences.

Documentary sources provide additional means of dating the structures and interpreting their functions. The following is a brief chronology of historical events related to the area of Simpson Springs and the general routes which passed near the four excavated structures:

1807

William Bradford Waddell, co-owner of the Pony Express, was born October 17 in Fagnier County, Virginia. After he married, he moved to Lexington, Missouri (Carter 1960:8).

1812

William Hepburn Russell, one of the later co-owners of the Pony Express, was born January 21; his family later moved to Lexington, Missouri (Carter 1960:6).

1814

Alexander Majors, another co-owner of the Pony Express, was born in Kentucky October 3, and four years later moved to Jackson County, Missouri (Carter 1960:6).

1830

Fur traders Jedediah S. Smith, David E. Jackson and William L. Sublette left St. Louis by wagon over the Oregon Trail (Chapman 1932:70).

1840

Overland immigration to California had begun from the East (Floyd 1958:19).

1846

Mormon Battalion reached California (Carter 1960:1).

Donner party stranded in snow east of Placerville (Chapman 1932:41).

August 15--California declared a territory of the United States (Floyd 1958:19).

Majors began freighting activities with the Pottawattamie Indians, since he could not support his family by his farm (Carter 1960:6).

1847

Mexican war (Chapman 1932:29).

Mormons arrived and begin to settle the Great Salt Lake Valley.

1848

By action of Mormon Conference, four men went to Winter Quarters for mail (Carter 1960:3).

Three ocean steamers sailed for California from New York with the mail (Carter 1960:1).

Guadalupe-Hidalgo treaty in which all of California was ceded to the United States by Mexico (Floyd 1959:19-20).

Majors received a contract to carry freight to Santa Fe (Carter 1960:7).

Discovery of gold in California (Pack 1923:29). Chapman (1932:30) states that gold was discovered by James Marshall.

1849

"Forty-Niners" flocking to California to get rich by finding gold (Floyd 1958:21).

42,000 emigrants crossed the plains, many of which were supplied by the freighting firm Russell, Majors and Waddell (Carter 1960:3).

First government post office in Salt Lake Valley was established (Carter 1960:3).

1850

Utah was created a territory (Carter 1952:5), and California was admitted to the Union as the 31st state (Carter 1960:1). Mail Service extended to Utah (Carter 1960:3).

American Express Company formed by the merger of Livingston, Fargo and Company; Wells & Co.; and Butterfield and Wasson (Jackson 1966:295).

Samuel H. Woodson received first contract to carry mail from Independence, Missouri to Salt Lake City (Carter 1960:3).

1851

George Chorpenning and Absolom Woodward (later killed by Indians) were awarded the first Overload Mail contract between Sacramento and Salt Lake City. They erected stations along the way and became known as the Jackass Mail (Carter 1960:2; Chapman 1932:40-41).

1852

The Indians massacred Woodward the year before, and now the attacks were becoming so bad that Chorpenning made the mail run alone (Carter 1960:2).

Wells, Fargo & Co. established in New York (Jackson 1966:296).

Dick Wootton took sheep to California (Bluth 1975:1).

1853

Majors received a freighting contract from the government.

Howard Egan explored the route west of Salt Lake (Mabey 1954:10).

1854

William F. McGraw given mail contract, mail to be carried by monthly coach, with passengers (Carter 1960:4).

Lieutenant E. G. Beckwith crossed the area on a railroad survey (Bluth 1975:1).

Chorpenning awarded a second government mail contract between Salt Lake City and San Diego (Carter 1960:2).

1855

Majors joined with Russell to transport military supplies west of the Missouri River (Carter 1960:7).

Railroad built across the Isthmus of Panama to speed up mail going by steamers (Floyd 1958:22).

Howard Egan searched the route south of Salt Lake (Bluth 1975:2).

Senator William Gwin, California, introduced a measure in Congress to establish a mail route over the Central Route (Carter 1952:6), also known as Egan's Trail; to those heading west it became known as the Simpson route, although not the same. It varied a few miles, ran from 40 degrees north latitude to Hastings Pass and branched southerly to Carson City, then south to Genoa (Carter 1952:16).

1856

McGraw contract given to Hyrum Kimball (Carter 1960:6).

1857

2,500 U.S. troops stationed at Fort Leavenworth ordered to march to Utah by General Winfield Scott (Carter 1960:5). Kimball's contract cancelled and Johnston's Army approached Utah (Carter 1960:5). Russell, Majors and Maddell had contracts to freight army supplies (Carter 1960:5).

S. D. Miles given mail contract between Missouri and Salt Lake (Carter 1960:5).

1858

Chorpenning awarded contract to carry mail over the Central Overland route between Placeville, California and Salt Lake City. Stages were to carry mail between small stations 20 to 40 miles apart (Carter 1960:2).

Chorpenning used the "Egan Route" for his mail line. He erected five stations, with Egan in charge of the line (Bluth 1975:6-7).

J. H. Simpson Expedition--Simpson Springs initially called "Pleasant Springs" (Simpson 1876:48).

Butterfield Stage Line inaugurated over the Southern Route (Carter 1952:6). Camp Floyd established July 4 by Brigadier General Albert Sidney Johnston and 3,000 men of the Utah Expeditionary forces (Carter 1952:40).

Waddell joined the firm of Russell and Majors (Carter 1960:8).

Firm of Jones and Russell established to run coaches between the Missouri River and Denver (Carter 1960:10).

Miles Contract annulled and given to Hockaday & Company in a weekly schedule (Carter 1960:5).

First stage coach from San Francisco arrived in St. Louis over the Butterfield Route (Chapman 1932:70).

1859

Chorpenning first developed the site of Simpson Springs. He erected a Sibley tent on a circular stone wall and built a reservoir across the spring's drainage channel. A corral was also built to hold eight oxen (Bluth 1976:8).

Robert Jarvis started an Indian service farm to keep Indians from raiding mail company stations (Bluth 1975:15).

Russell, Majors and Waddell obtained mail contract from Hockaday & Company.

J. H. Simpson, topographical engineer, obtained orders from General Johnston to explore the Great Basin to find a desert route (Carter 1952:16).

Russell, Majors and Waddell bought out Jones and Russell, and bought the firm of Hockaday and Liggett, which ran a stage line from St. Joseph, Missouri, to Salt Lake City (Carter 1960:11).

By the end of this year six mail routes led to the Pacific Coast. The most reliable line was the steamer from New York to San Francisco (Carter 1960:12).

1860

Chorpenning contract for mail along the Central route annulled (Carter 1960:2).

April 3--first Pony Express rides left St. Joseph, Missouri (Carter 1952:7).

May 1--Colonel Phillip St. George Cooke took command of Camp Floyd (Carter 1952:40).

June 16--Congress authorized the building of the transcontinental telegraph from Missouri River to the Pacific Coast.

When Johnston's army was ordered from Camp Floyd, the supply wagons and oxen of Russell and Majors were sold (Carter 1960:9).

Central Overland and Pike's Peak Express Company organized after the decision was made to establish the Pony Express (Carter 1960:12).

Russell, Majors and Waddell began to purchase the Chorpenning mail and stage line and the Leavenworth and Pike's Peak Express, which ran a stage line between Leavenworth and Denver (Carter 1960:12).

Simpson Springs station was purchased by the Pony Express from Chorpenning as a place to stay overnight.

1861

Civil War started.

Butterfield Overland Mail attacked by Confederate troops and stages detained (Carter 1960:20).

Edward Creighton started construction of the electric telegraph between Omaha and Salt Lake City for the Pacific Telegraph Company, while James Gamble, Overland Telegraph Company started construction from the west. These companies later merged as Western Union (Chapman 1932:281).

July 1--Government abandoned the Butterfield route to the south to get it out of the hands of the Confederates, and started a daily mail stage over the Central Overland route (Carter 1952:53; Chapman 2932:267).

July--the Pacific Telegraph line moved westward from the Missouri River and eastward from San Francisco, shortening the Pony Express run (Carter 1952:53).

October 1861--telegraph lines were joined at Salt Lake City. To the west the lines almost followed the Pony Express trail (Carter 1952:54). By this arrival, the Pony Express was officially terminated, but it did not discontinue until after November, when the last letters were delivered (Settle 1959:120).

George Dewees, the Pony Express keeper at Simpson Springs, lived in a house of stone (Bluth 1976:8).

Overland Mail Company formed by the merger of Central Overland, California and Pike's Peak Company and Central Overland Pony Express Company, and the Butterfield-Wells-Fargo (Chapman 1932:267-268). Benjamin Holladay operated the stage and, temporarily, the Pony Express east of Salt Lake City; Butterfield-Wells-Fargo operated the business to the west (Chapman 1932:268).

There were few Indian troubles this year.

There were Overland improvements to the Central Route (Bluth 1976:8).

1862

Assets of the Central Overland and California Pike's Express Company were put up for sale because of indebtedness (Carter 1960:22).

Fort Ruby established in Ruby Valley (Bluth 1975:19).

1863

Holladay Overland Mail and Express Company hauled mail and passengers from Atchison, Kansas to Placerville, California through Salt Lake City (Smith 1960:138).

Indians attacking stations--Overland War.

1864

Mail contracts made the Overland Mail Company responsible for the line west from Salt Lake City and Ben Holladay responsible to the east (Jackson 1966:306).

Wells, Fargo and Company operate a Pony Express north from San Francisco and Sacramento to Marysville and south to San Jose (Chapman 1932:38).

1866

Overland Mial Company; Wells, Fargo and Co.; and Holladay and other express companies consolidated under Wells, Fargo and Co. (Jackson 1966:306).

November--Wells, Fargo and Co. operating stagecoaches throughout the West (Jackson 1966:307).

1867

Transcontinental railroad being constructed, with Wells, Fargo and Co. operating mail and passenger routes from terminals (Jackson 1966:307).

1869

Transcontinental railroad completed (Smith 1960:140).

Union Pacific and Central Pacific Railroads met at Promontory Point, Utah (Pack 1923:29).

Telegraph along the Central Route abandoned.

Wells Fargo suspended service along the Central Route, and the stations were abandoned.

1870

Development of cattle and sheep industry along the Central Route west of Salt Lake City and the use of the range for grazing (Bluth 1975:40).

1872

William B. Waddell died April 1 in Lexington, Missouri (Carter 1960:23).

William H. Russell died September 10 in Palmyra, New York (Carter 1960:22).

1873

Hyrum B. Clawson, Jr. occupied a single structure at Simpson Springs (Bluth 1975:25 and 1976:8).

1878

Howard Egan died in Salt Lake City.

1890

The Mulliner family developed a local stage line from Fairfield (formerly Camp Floyd) to Ibapah and built a large log building at Simpson Springs (Bluth 1975:25).

Alvin Anderson built a stone cabin at Simpson Springs from ruins (Bluth 1975:26 and 1976:9).

1891

James Sharp visited Simpson Springs and reported a two room stone cabin, not standing, and a stable 16 feet x 25 feet. One of these structures had a cedar roof, windows in the east and west walls, and a door in the end (Bluth 1975:25 and 1976:9).

1900

Alexander Majors died January 14 and was buried in Kansas City, Missouri (Carter 1960:22).

1918

Air mail route established in the United States (Pack 1923:29).

1939

Civil. Conservation Corps (CCC) camp was constructed at Simpson Springs (Baldridge 1971:373-374).

1942

CCC phased out (Baldridge 1971).

Summary

What is known about Simpson Springs, specifically, from available historical documents is summarized as follows:

1. We know that several people passed through either on the trail or in the area: Chorpenning (1851), Wooton (1852), Egan (1853), McGraw (1854), Beckwith (1854), Chorpenning (1858), Simpson (1858), Pony Express (1860-61), Telegraph (1861-69), Butterfield Mail (1861), Holladay Overland Mail (1863), Wells Fargo & Co. (1866), transcontinental railroad (1869), and cattle and sheep drives (after 1870).

2. Some information is available regarding structures at Simpson Springs:

    a. George Chorpenning constructed some stations along the route in 1851, but it is not known if one was built at Simpson Springs.

    b. Chorpenning built many more stations in 1858.

    c. Chorpenning developed the site of Simpson Springs by erecting a Sibley tent on a circular stone wall in 1859.

    d. Simpson Springs station was purchased by the Pony Express in 1860 as an overnight stop.

    e. George Dewees, Pony Express station keeper, lived in a stone house in 1860.

    f. The station was abandoned in 1869.

    g. Hyrum B. Clawson, Jr. lived in a single structure at Simpson Springs in 1873.

    h. The Mulliner family built a large log building at Simpson Springs in 1890.

    i. Alvin Anderson built a stone cabin at Simpson Springs in about 1890.

    j. In 1891 James Sharp noted the ruin of a two-room stone cabin and a 16 feet x 25 feet stable. One had a cedar roof, windows and door.

    k. Civil. Conservation Corps constructed its camp in 1939.

Although many adventurous men passed near Simpson Springs, trails and camping areas of these individuals have not been identified. Erosion, vegetation, animals, collectors, construction or other factors may have taken their toll, making identification almost impossible.

At Simpson Springs it is clear that a circular stone foundation was constructed for a Sibley tent, and that a stone house or houses existed through time. There also existed a large log cabin, a stable, and a CCC camp. Possibly the reference to a stone structure at different points in time actually refers to the same building, which lay in ruin in 1891.

The stone building of Structure 1, by artifact analysis, dates between 1851 and the present. These dates place its use within the range of time pointed out in the historical documents pertaining to the area. The lack of any other evidence for stone construction around the spring seems to suggest that the various stone structures mentioned in documentary sources are the same building. Possibly the same wall stone and foundation were reused in construction, or the same building was remodeled. Therefore, Structure 1 was, most likely, the station used by the Pony Express and other mail carriers and stagecoach companies. Apparently, in 1891 the stone building lay in ruin. It is not known if the stone ruin Sharp inspected in 1891 was the building Alvin Anderson supposedly built in 1890 or that of the Pony Express, or if both are the same building. If they are the same, then Anderson's cabin did not last long. If they are different structures, then possibly what Sharp saw was the ruins of the station, and he failed to mention Anderson's cabin, which could have been Structure 3.

The earliest foundation discovered during the excavations at Simpson Springs was the circular stone foundation of Structure 2. Dating of this ruin falls before 1865 and ends near 1911. Archaeological evidence does not suggest that there was much of a building over the foundation. No evidence of stone walls, nails for framing or roofing, or roofing materials was discovered at this one site. There is a very strong resemblance between the circular foundation of Structure 2 and the circular foundation made for the Sibley tent in 1859.

Structure 3 does not have archaeological features comparable to those described in historical documents. Archaeological evidence suggests a date of occupation after the turn of the century; however, the building could have been cleared of artifacts when the tie floor was incorporated. It seems likely that the railroad tie floor was placed in the structure in the early 1930s. It appeared from the archaeological evidence that this building originally had a dirt floor, and the tie floor was laid later--how much later is not known.

Structure 4, a pit structure with a possible well in one corner, has no comparatively similar structure in the literature examined. This structure appears to have been occupied at the turn of the twentieth century. It is possible that Structure 4 was associated with the log building constructed by the Mulliner family in 1890. The actual purpose of Structure 4 is not known, but it may have been a root cellar or dugout. The only evidence is the rectangular excavation without indications of walls, floor or roof construction. The ground in this excavation was extremely wet and may have decayed any evidence of wood construction. The considerable number of artifacts found in this pit, and their stratigraphic position seems to indicate that its later use (1900+) was for trash disposal. The actual dates of use for the pit structure are not known, but may be assumed to be near the dates of the artifacts found within it.

In summary, it would appear that Structure 1, both archaeologically and historically, is the stone station used by the Pony Express, and by later mail and cargo carriers. Its actual date of construction is not clear, but it was in operation by George Dewees in 1860. After the abandonment of the stations in 1869, Hyrum Clawson, Jr. lived in a single structure, which could have been Structure 1 if "single structure" means a single dwelling unit and not a single room, and if it was constructed of stone. It seems likely that the stone cabin built by Alvin Anderson in 1890 was at the station site when James Sharp viewed the ruins one year later. However, it is not clear which structure was Anderson's, but there can be little doubt that Structures 1 and 2 were present. Structure 1 was most likely the ruin Sharp observed at the time.

It seems reasonable to assume that Structure 2 is the foundation of the Sibley tent constructed by George Chorpenning in 1859. The lack of any other architectural details supports the contention of a tent being used on top of the foundation of Structure 2.

Structure 3 may be related to the construction of a stone building by Alvin Anderson in 1890. If so, a railroad tie floor must have been placed in it in the early 1930s, possibly by members of the Civil Conservation Corps. The effect of the CCC on ruins at Simpson Springs is not clear--how much digging they did, how much stone was removed from the ruins for their own construction, etc. They built a rock wall in front of their camp.

Structure 4 may be a root cellar associated with Structure 3. If so, then it was destroyed long before the latter. It may have been part of the construction done by the Mulliner family in 1890. The artifacts suggest correspondence with the latter more than after the turn of the century.

The combination of historical and archaeological data may be summarized as follows:

1851-1858	no structures	Trails through or by Simpson Springs
1859	Structure 2	Foundation of the Sibley tent
1860-1869	Structure 1	Stone house for use by the Pony Express, telegraph, Overland Mail, Wells Fargo & Co., and other mail and cargo carriers

1870-1890	Structure 1 (?)	Hyrum B. Clawson, Jr.
1890-1900	Structure 4 (?)	Large log building built by Mulliner family
	Structure 3 (?)	Alvin Anderson
1900-1930±	Structure 3	Railroad tie floor placed
1939	CCC camp	Facilities built by Civil. Conservation Corps
1942		CCC abandoned area

For a long time, possibly as far back as the 1870s, sheep herders have passed through the area and watered their flocks at Simpson Springs. Mail for these individuals was collected at Vernon, Utah, at least at the turn of the twentieth century. In 1910, Matilda Pehrson Bennion, assistant postmaster, Vernon, Utah, obtained names of sheepherders wintering near Simpson Springs in order to deliver their mail to them. There was no post office at Simpson Springs, but mail carriers traveling to Ibapah, Erekson or Indian Springs would drop the mail off. These three mail routes, each originating at Vernon, operated from 1903 to 1933. "The sheepherders generally worked in pairs, one managing the wagon and supplies, referred to as the camp mover, the other riding a saddle horse and maneuvering the sheep, with the aid of dogs. This man was usually referred to as the herder or tender" (Bennion, 1974).

The condition of stations like Simpson Springs, whether used for Pony Express, Overland Mail or cargo carriers, was much more primitive than those east of Salt Lake City. In the east, the stations were relatively comfortable, much like a home, and did not include the persistent danger of Indian attack. The westerly stations, particularly those in the desert, were generally constructed of materials available, such as stone, adobe, or crude shakes of rough wood. Occasionally dugouts were excavated into the side of a favorable hill or cliff. The roofs of these structures were covered with logs, brush or dirt (Settle and Settle 1955:45).

Usually there was a station keeper and stock tender at each stop where ponies had to be exchanged. Where stagecoaches, mail carriers, wagon trains and travelers stopped for overnight, the stations were larger and more help was required. Families of station keepers did not stay at the stations west of Salt Lake City, due to the extreme danger of Indian attack. The stations were ten to fifteen miles apart, and location was based on the distance a horse could run, not on proximity to settlements or water. Water was obtained by digging wells or hauling in barrels (Settle and Settle 1955:44-45).

Most likely a station keeper was either a jack-of-all-trades capable of being a carpenter, blacksmith, wheelwright, and housekeepr, or else he lived in even more primitive conditions. Construction at Simpson Springs was accomplished by utilizing local wood and stone resources.

Inside the stations, accommodations were very rudimentary for those in the remote desert areas. The floor was packed dirt and some stations had no glass windows. Furniture consisted of boxes and benches, and bunks built into the walls for beds (Reinfeld 1866:70).

Those who could, probably cut local timber and made rough furniture to the best of their individual ability. Previous caretakers may have left behind some household items also. The only evidence of interior furnishings discovered during the excavation at Simpson Springs was iron stove parts.

Time was not taken to hunt; therefore, little fresh meat was consumed. The main diet consisted of "cured meats, mostly bacon, dried fruits, beans, bread baked upon the spot, molasses, pickles, corn meal when it could be had, and coffee (Settle and Settle 1955:17). Other items included hams, flour, tripe, syrup, salt and tea (Settle and Settle 1955:46). No alcoholic beverages were permitted (Reinfeld 1966:70).

Food was obtained by the wagon trains, which came once or twice a week. It would appear that food items were plentiful, except possibly when these cargo carriers were attacked by Indians, who probably wanted food items and horses, or when bad weather would not permit travel.

The evidence of food items used before 1869 was limited at Simpson Springs. Grocery items packed in glass may not have been hauled to the stations, and thus little evidence remained.

Items required to maintain the stations for housekeeping purposes included "brooms, tin dishes, candles, tin and wood buckets, blankets, matches, scissors, needles, thread, stoves, axes, hammers, and saws" (Settle and Settle 1955:46).

Evidence for some of these items from the structures excavated was present, particularly stove parts.

In the stables could be found "brushes, currycombs, horseshoe nails, manure forks, bridles, horse liniment, rope, farriers' tools and other items" (Settle and Settle 1955:46).

It seems likely that the station hands had to know or soon learn how to care for horses, including horseshoeing and wagon repairs. Although there was no archaeological evidence of blacksmithing at Simpson Springs, the discovery of horseshoes and horseshoe nails could be an indication that they were occasionally changed by some station keepers.

A number of items, such as horseshoes, horseshoe nails, curry comb, bridle parts, leather straps, buckles, etc., are all evidence of the care given to horses by the keepers at Simpson Springs.

Medicine was undoubtedly limited, and what was good for man was used on the animals. These included "turpentine, castor oil, copperas, borax, and cream of tartar" (Settle and Settle 1955:46).

For general maintenance around the stations, the following items were used: "nails, antelope skins, window sashes, screws, hinges, putty, well pulleys, wagon grease, monkey wrenches, rubber blankets, tin safes, stove dampers and twine" (Settle and Settle 1955:46).

All of the above items required for general survival and maintenance of the stations, horses and wagons were purchased by Russell, Majors and Waddell of the Pony Express company from R. B. Bradford and Company, Denver (Settle and Settle 1955:46).

The living conditions at the desert stations in Western Utah were rudimentary, even with supplies being hauled to them. Excavated bones suggest that few wild animals were sought by hunting. Station keepers, helpers, riders and passengers apparently were totally dependent on freight haulers. Rifles and pistols were used for protection, mostly from the Indians.

In summary, it is apparent that Simpson Springs had been occupied for some years after its initial construction. Many mail carriers, wagons, stagecoaches, Pony Express riders, individual travelers and coach passengers stopped to refresh themselves, possibly to rest overnight, or to stretch and eat. After the arrival of the railroad to carry mail, the station and the trail were used sparingly, possibly seasonally, as herders passed through.

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APPENDIX A

Identification of Animal Bone Specimens from Simpson Springs

by

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Label No.		Genus	Common Name	Bone
Provenience:		Structure 1, Room 1		
1		Ovis	sheep	right jaw
2		Ovis	sheep	jaw
3		Ovis	sheep	right jaw
4		Ovis	sheep	right femur
5		Ovis	sheep	right front foot phalanx
6		Bos	cow	right metacarpus
7		Ovis	sheep	right radius
Provenience:		Structure 1, Room 1, fill		
19		Ovis	sheep	jaw
20		Bos	cow	astragalus
21		Bos	cow	astragalus
22		Bos	cow	calcanium
23		Bos	cow	tibia
24		Ovis	sheep	astragalus
25		Ovis	sheep	tibia
26	cf*	Sylvilagus	cottontail rabbit	right pelvis
27	cf	Lepus	jack rabbit	sacrum
28		Ovis	sheep	right femur
29		Ovis	sheep	right calcanium
30		Ovis	sheep	left calcanium
31		Ovis	sheep	scapula
32		Ovis	sheep	right femur
33		Ovis	sheep	left humerus
34		Bos	cow	left metacarpus
35		Ovis	sheep	left metacarpus
36		Ovis	sheep	left metacarpus
37		Ovis	sheep	metatarsus
38		Ovis	sheep	right metacarpus
39		Ovis	sheep	left tibia
40		Ovis	sheep	cervical vertebra
41		Bos	cow	rib
42		Ovis	sheep	rib

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*cf in front of a genus name means: compares favorably with. . .

43		Ovis	sheep	lumbar vertebra
44		Ovis	sheep	thoracic vertebra
45		Ovis	sheep	cervical vertebra
46		Ovis	sheep	cervical vertebra
47		Ovis	sheep	axis
48		Ovis	sheep	atlas
49		Ovis	sheep	left pelvis
50	cf*	Ovis	sheep	left pelvis
51		Ovis	sheep	right humerus
52		Ovis	sheep	rib
53		Ovis	sheep	metatarsus
54		Gallus	chicken	tarsometatarsus
55-60		Ovis	sheep	proximal phalanges
61		Lepus	jack rabbit	left pelvis
62		Gallus	chicken	thoracic vertebra
63-64		Gallus	chicken	cervical vertebra
65-66		Gallus	chicken	carpometacarpus
67		Lepus	jack rabbit	left humerus
68-69		Ovis	sheep	jaw
AD		Ovis	sheep	radius
AE		Ovis	sheep	tibia

Provenience: Structure 1, Room 2

1A		Ovis	sheep	jaw
1A-1B		Gallus	chicken	ulna
1C		Gallus	chicken	left humerus
1D		Sylvilagus	cottontail rabbit	left femur
1E		Gallus	chicken	right humerus
1F		Lepus	jack rabbit	left humerus
1G-1H		Gallus	chicken	right humerus
1I-1L		Gallus	chicken	coracoid
1K-1N		Ovis	sheep	left calcanium
1P		Ovis	sheep	right astragalus
1O		Ovis	sheep	left astragalus
1R		Ovis	sheep	tarsal
1S-1V		Ovis	sheep	proximal phalanx
1W		Ovis	sheep	left tarsal
1X-2B		Ovis	sheep	medial phalanx
2C		Ovis	sheep	right radius-ulna (fused)
2D		Ovis	sheep	right radius
2E-2I		Gallus	chicken	tibiotarsus
2J		Ovis	sheep	left metatarsus
2K		Bos	cow	right metatarsus
2L-2M		Ovis	sheep	left metacarpus
2N		Ovis	sheep	scapula
2O		Ovis	sheep	tibia
2P		Ovis	sheep	right femur
2Q		Bos	cow	left tibia
2R		Lepus	jack rabbit	femur
2S-2U		Gallus	chicken	tarsometatarsus
3A		Ovis	sheep	vertebra
3B	cf	Ovis	sheep	atlas vertebra

3C	cf	*Ovis*	sheep	cervical vertebra
3D-3G		*Gallus*	chicken	sternum
3H		*Gallus*	chicken	synsacrum and pelvis
3I-3J		*Gallus*	chicken	sacrum
3K-3M		*Gallus*	chicken	pelvis
3N	cf	*Ovis*	sheep	pelvis
3P-3Q		*Gallus*	chicken	skull
3R			rodent	indeterminate
3S		*Gallus*	chicken	cervical vertebra
3T-3U		*Gallus*	chicken	lower beak
3V-3W		*Gallus*	chicken	thoracic vertebra
3X		*Lepus*	jack rabbit	pelvis
3Y		*Gallus*	chicken	radius
3Z		*Lepus*	jack rabbit	radius
4A		*Gallus*	chicken	coracoid
4B		*Ovis*	sheep	metacarpus
4C	cf	*Sciurus*	squirrel	partial skull
4D	cf	*Sciurus*	squirrel	tibia
4E	cf	*Sciurus*	squirrel	humerus
AA-Ac		*Ovis*	sheep	tibia

Provenience: Structure 1, Room 1

4F	*Sus*	pig	jaw
4G	*Ovis*	sheep	tibia
4H	*Ovis*	sheep	right pelvis
4I	*Ovis*	sheep	scapula

Provenience: Structure 2

4J	*Bos*	cow	scapula
4K	*Bos*	cow	tarsal
4L	*Bos*	cow	phalanx
4M	*Bos*	cow	vertebra
4N	*Ovis*	sheep	scapula
4P	*Ovis*	sheep	radius-ulna (fused)
4Q	*Ovis*	sheep	phalanx
4V	*Ovis*	sheep	scapula

Provenience: Structure 1, Room 1

4R	*Lepus*	jack rabbit	femur
4S	*Ovis*	sheep	distal phalanx (hoof)
4T	*Ovis*	sheep	astragalus
4U	*Ovis*	sheep	phalanx
4W	*Sylvilagus*	cottontail rabbit	tibia
4X	*Ovis*	sheep	tibia
4Y	*Sciurus*	squirrel	skull
4Z	*Ovis*	sheep	phalanx
5A	*Ovis*	sheep	scapula
5A'	*Lepus*	jack rabbit	lower jaw

Provenience: Structure 1, fill

5B	Ovis	sheep	pelvis
5C-5D	Ovis	sheep	cervical vertebra
5E	Ovis	sheep	atlas vertebra
5F	Lepus	jack rabbit	left femur
5G	Ovis	sheep	astragalus
5J	Bos	cow	rib
5K	Ovis	sheep	rib
5L	Gallus	chicken	femur
5M	Lepus	jack rabbit	femur
5N-5O	Ovis	sheep	phalanx
5P	Lepus	jack rabbit	right humerus
5Q	Ovis	sheep	phalanx
5R	Lepus	jack rabbit	metapodial
5S	Canis familaris	dog	metapodial
5T	Lepus	jack rabbit	axis
5U	Gallus	chicken	synsacrum

Provenience: Structure 1, Room 3

5U-5V	Lepus	jack rabbit	lumbar vertebra
5W	Gallus	chicken	tarsometatarsus
5X	Ovis	sheep	cervical vertebra
5Y	Lepus	jack rabbit	metapodial
5Z	Ovis	sheep	distal phalanx (hoof)
6A-6B	Ovis	sheep	scapula
6C	Ovis	sheep	cervical vertebra
6D	Ovis	sheep	radius epiphysis
6E	Sciurus	squirrel	pelvis

Provenience: Structure 1, trash pit (outside)

6F-6G	Ovis	sheep	tibia
6H	Ovis	sheep	femur
6I	Ovis	sheep	scapula
6J	Ovis	sheep	jaw
6K	Ovis	sheep	vertebra
6L-6O	Bos	cow	thoracic vertebra
6P	Bos	cow	scapula
6Q	Sus	pig	calcanium

Provenience: Structure 1, Outside west wall

6S	Ovis	sheep	radius
6T	Bos	cow	vertebra
6U	Ovis	sheep	vertebra
6V	Ovis	sheep	phalanx

Provenience: Structure 1, Room 1

6W	*Ovis*	sheep	femur
6X	*Ovis*	sheep	phalanx
6Y	cf *Lynx ruffus*	bobcat	scapula

Provenience: Structure 1, Room 1

6Z	*Ovis*	sheep	femur
7A	*Ovis*	sheep	metapodial
7B	*Lepus*	jack rabbit	scapula
7C		rodent	pelvis
7D-7G	*Lepus*	jack rabbit	metapodials
7H	*Canis familiaris*	dog (coyote?)	vertebra
7I	*Canis familiaris*	dog	vertebra

Provenience: Structure 1, Outside south wall

7J-7K	*Ovis*	sheep	thoracic vertebra
7L	*Ovis*	sheep	sacrum
7M-7N	*Ovis*	sheep	lumbar vertebra

Provenience: Structure 1, Room 1

6R	*Lepus*	jack rabbit	scapula
7O	*Ovis*	sheep	metapodial
7P	*Ovis*	sheep	scapula
7Q	*Ovis*	sheep	thoracic vertebra

Provenience: Outside Structure 1, trash pit

7T	*Bos*	cow	phalanx
7U	*Bos*	cow	skull fragment
7V	*Bos*	cow	cervical vertebra
7W	*Sylvilagus*	cottontail rabbit	skull
7X	*Gallus*	chicken	carpometacarpus
7Y	*Gallus*	chicken	femur
7Z	*Ovis*	sheep	femur
8A	*Ovis*	sheep	pelvis
8B	*Ovis*	sheep	cervical vertebra
8C	*Bos*	cow	podial

Provenience: Structure 4

8D	*Ovis*	sheep	humerus
8E	*Ovis*	sheep	radius
8F	*Ovis*	sheep	ulna
8G	*Ovis*	sheep	humerus
8H	*Ovis*	sheep	radius
8I	*Bos*	cow	humerus
8J-8L	*Ovis*	sheep	scapula

8M	Bos	cow	tibia
8N	Ovis	sheep	femur
8P	Ovis	sheep	pelvis
8Q	Bos	cow	radius
8R	Bos	cow	femur
8S	Bos	cow	scapula
8T	Sus	pig	jaw
8U	Canis latrans	coyote (dog?)	skull
8V-8W	Canis latrans	coyote (dog?)	jaw
8X	Canis	coyote or dog	skull fragment
8Y	Bos	cow	humerus
8Z	Ovis	sheep	pelvis
9A	Ovis	sheep	tibia
9B	Ovis	sheep	sacrum
9C	Ovis	sheep	pelvis
9D	Ovis	sheep	metatarsus
9E-9F	Ovis	sheep	atlas
9G	Ovis	sheep	astragalus
9H-9I	Ovis	sheep	metatarsus
9J	Ovis	sheep	lumbar vertebra
9K	Equus	horse	distal phalanx (hoof)
9L	Ovis	sheep	tibia
9M	Ovis	sheep	femur
9N,9P	Bos	cow	tibia
9Q	Ovis	sheep	femur
9R	Ovis	sheep	tibia
9S	Ovis	sheep	scapula
9T	Ovis	sheep	metatarsus
9U	Ovis	sheep	metacarpus
9V	Sus	pig	metapodial
9W	Ovis	sheep	radius
9X	Ovis	sheep	tibia
9Y	Ovis	sheep	scapula
10A-10F	Ovis	sheep	phalanx
10G	Ovis	sheep	calcanium
10H-10I	Ovis	sheep	cervical vertebra
10J-10K	Ovis	sheep	lumbar vertebra
10L-10M	Ovis	sheep	pelvis
10N	Ovis	sheep	metatarsus
10O	Ovis	sheep	metapodial
10Q	Ovis	sheep	tibia
10R	Ovis	sheep	tarsal
10S	Ovis	sheep	metatarsus
10T	Ovis	sheep	metapodial
10U	Bos	cow	scapula
10V	Mephitis	skunk	jaws, vertebrae and limb bones
10W	Lepus	jack rabbit	partial skeleton including jaws, vertebrae, limb and foot elements.

APPENDIX B

Identification of Cuts of Meat from Butchered Bones Found at Simpson Springs

by

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Brigham Young University

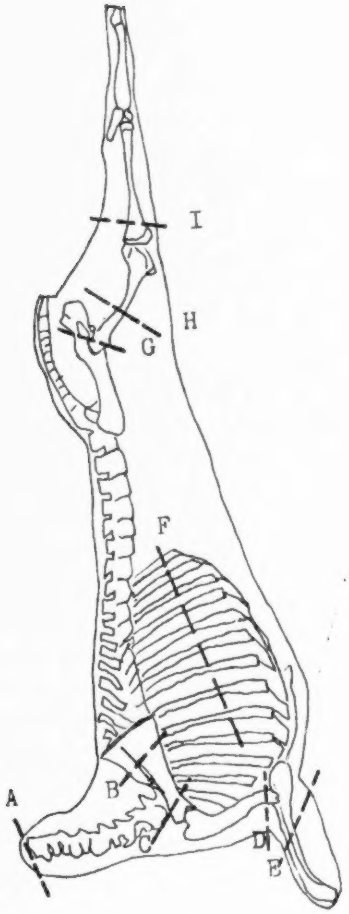
Lamb (Figure 101a)

Lamb or mutton was the principal cut meat. There was an atlas which has been cut through, presumably to remove the head from the body of the animal (cut A). The scapula (shoulder blade) was cut through at the proximal end and through the middle. Two shoulder roasts were made from these cuts (B and C). A humerous was cut through at the distal end, and the ulna and radius were cut through at their proximal ends (cuts D and E). The area between D and E is a knuckle and was probably used for stew or soup. The ribs were cut through to make spare ribs (cut F). The pelvis and the femur were cut through to make a rump roast (cuts G and H). A leg of lamb was created when cuts H and I were made. From cuts E and I to the end of each leg is good stew meat.

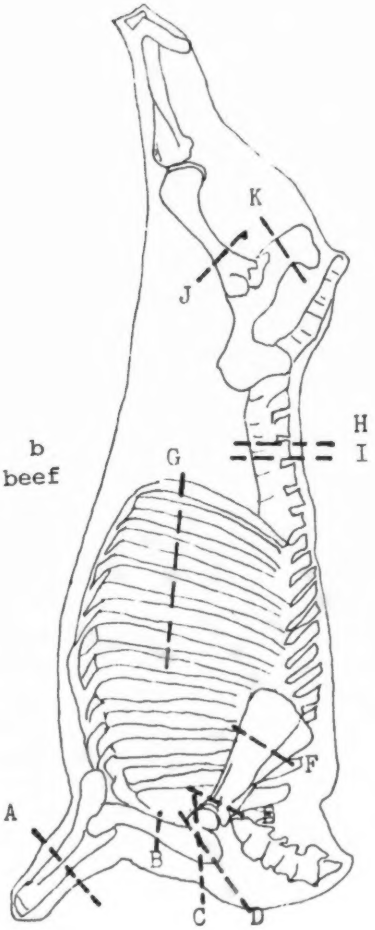
Beef (Figure 101B)

Due to the similarity of the cuts, that is, the angle, the locality on the bone, and the bone cut, it is evident that either one individual cut all the meat or that one principal method was taught to all who cut up the meat. The mutton and beef were cut up in almost identical fashion. The main cuts of meat were shoulder roasts and leg of lamb roasts. The knuckle was commonly cut off and presumably used for stew or soup of some kind. It is probable that the majority of the meat eaten was removed from the bone without cutting the bone itself or the carcass was cut through at the joints between the bones, again leaving the bones uncut. This would account for the large difference in the number of mutton bones cut as compared to beef bones cut. Lamb or mutton is much easier to butcher because the bones are small. It takes considerable energy to cut through some of the larger beef bones.

From cut A to the end of the leg is good stew meat (shank meat). Cuts B, C, and D in the humerus create round bone roasts. One roast would begin at the radius-ulna-humerus joint and end at cut B and cuts C and D. Cuts C and D are the same cut on different bones. Cuts E and F would create blade cut and round bone roasts (chuck roasts). Cut G would make short ribs. Cuts H and I would make one T-bone steak. Cut J would remove the round from the rump. Cut K would create a rump roast.



a
lamb


K
J
H
I
G
F
A
E
B
C
D

b
beef

Figure 101.
Cuts of meat from Simpson Springs.

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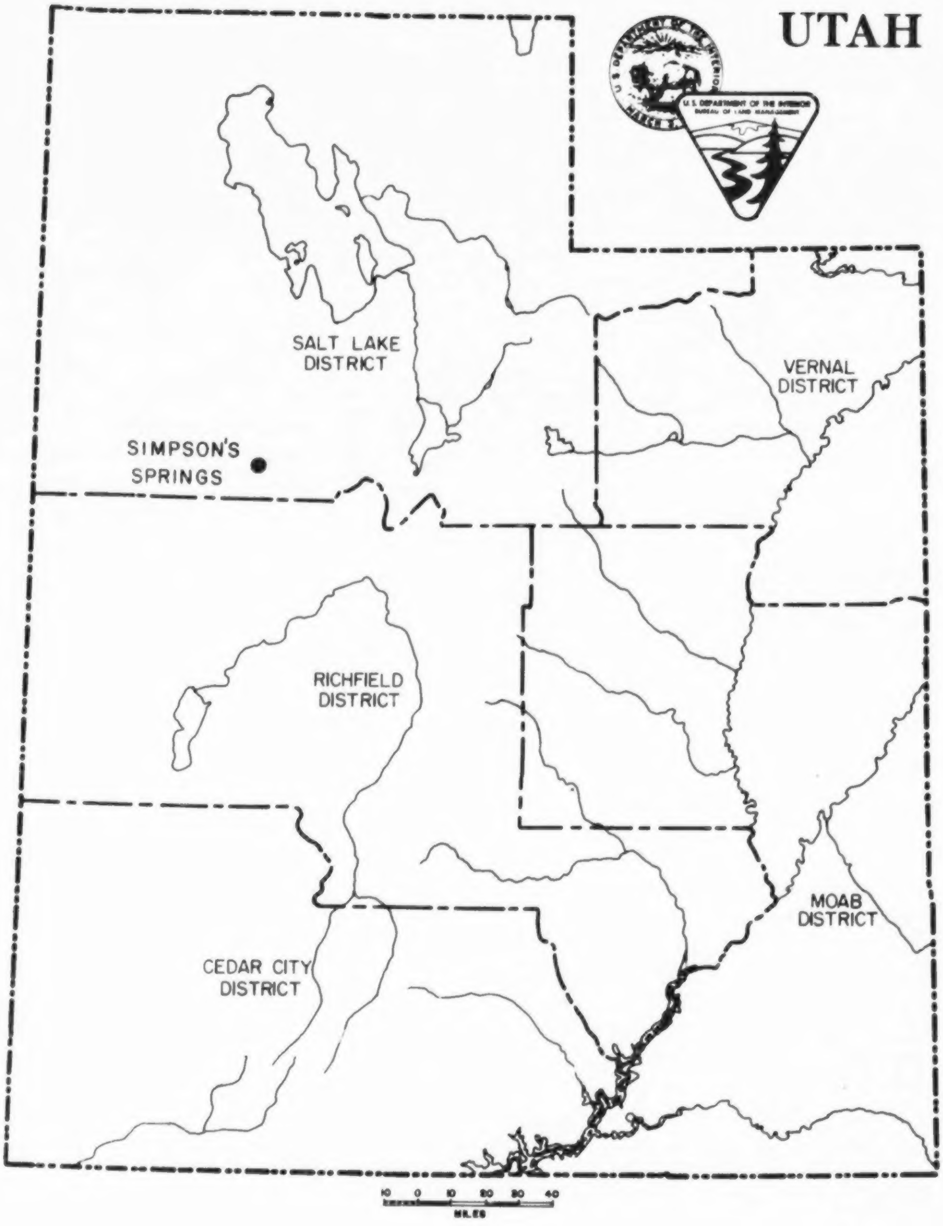
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